IDENTIFYING REFERENTS FOR ANAPHORIC NOUNS AND PRONOUNS IN SPOKEN ENGLISH

by

Majzoub Rahamtalla Omer

Thesis submitted to the University of Edinburgh for the degree of Doctor of Philosophy

Department of Linguistics

University of Edinburgh

September, 1981

ABSTRACT

Three experiments were performed in order to test the claim that the difference between the effectiveness of pronouns and repeated nouns in identifying the referent for the listener is affected by (1) the communicative norms shared by the speaker and the listener (2) the distance between the antecedent and the anaphor (3) the status of the antecedent. The results of these experiments seem to provide evidential support for this claim. In Experiment 1, the subjects were presented with sentences in which (1) no intervening sentences separated the antecedent and the anaphor (2) the antecedent was either surface subject or surface object (3) the anaphoric form was either the pronoun or the repeated noun. The results of this experiment showed that when the antecedent is subject, the pronoun was faster than the noun whereas when the antecedent is object, the pronoun and the noun were alike. Experiment 2 differed from experiment 1 in that (1) the antecedent was surface subject only (2) the referent is uniquely identified by the referring expression (e.g. Mrs. Thatcher .... She / Mrs. Thatcher). The results of this second experiment were the same as those of the first (antecedent subject). These results suggest that the difference between the pronoun and the noun (antecedent subject, no intervening sentences) should be viewed as a difference between an unmarked form (ie the pronoun) and a marked one (ie the repeated noun) and not, as it is widely believed, as a difference between an unambiguous form (ie the pronoun) and an ambiguous one (ie the repeated noun). Experiment 3 differed from Experiment 1 in that intervening sentences containing other referents separated the antecedent and the anaphor. The results of this experiment showed that, when the subject and the object antecedents are treated together, the referent was identified faster when the noun is repeated than when it is pronominalised.

Furthermore, Experiment 3 showed that the difference between the pronoun and the noun was affected by whether the antecedent is surface subject or surface object. When the antecedent is subject, the pronoun and the noun were alike whereas when the antecedent is object, the noun was faster than the pronoun. Another aim of Experiment 1 was to compare the non-native speakers' performance with that of the native speakers. This comparison showed that the difference between the pronoun and the noun for the non-native speakers was not the same as that between the pronoun and the noun for the native speakers. The implications of this for teaching the two anaphoric forms to non-native speakers of English were discussed.

ACKNOWLEDGEMENTS

I wish to express my gratitude to the Sudanese Government for providing me with the financial means without which this research would not have been possible. I am also indebted to the University of Khartoum for granting me the necessary leave of absence from my teaching post.

I would also like to express my gratutude to Dr. Gillian Brown, my Supervisor, for her inspiring and most valuable guidance throughout my work. Without her, this thesis would have hardly been possible.

Thanks are also due to Mrs. Ellen Bard for useful advice on experimental design and statistical analysis.

I also wish to express my gratitude to Steward Smith who designed the hard-ware for the experiments; to Norman Dryden who wrote the Computer programmes for the experiments; to John MacRae and Jeff Dodds who helped in designing the equipment and in the administration of the experiments; to John Fisher and Bill Crewe who recorded the materials used in the experiments; to Alan Kemp, J.K.F. Anthony, and Judy Higgs who helped to provide me with subjects; to Irene MacLeod and Anne Anderson who helped in the statistical analysis.

The thesis has been typed by Miss Angela St. Hill. I wish to thank her for her excellent and professional work.

Finally, I thank my wife and son for their unfailing support and encouragement during the period in which this research was being done.

TABLE OF CONTENTS

LIST OF FIGURES

DECLARATION

I hereby declare that this thesis has been composed by me and is entirely my own work.

PART A: THEORETICAL CHAPTERS

CHAPTER ONE

INTRODUCTION

1.1 PURPOSE AND RATIONALE OF THE STUDY:

An omnicompetent speaker of a language has available to him a large set of options (perhaps innumerable) from which he can choose only one at a time to refer back to a referent which has been introduced in the preceding discourse.[1] Two of these options are pronominalization and noun repetition as in 1 below:

1. John hit Cathy. a.He/b. John was drunk.

The major purpose of this study was to find out the circumstances in which one anaphoric form rather than the other (ie pronoun or repeated noun) would be more effective in identifying the referent for the listener.

Various scholars (cf. Bloomfield, 1933; Geach, 1962; Crymes, 1968; Lesgold, 1972; Halliday and Hasan; 1976; Hirst and Brill, 1980) have argued that the use of the pronoun (as in 1a above) is more effective than the repetition of the noun (as in 1 b above) in identifying the referent for the listener (e.g. "John" in 1). The theory advocated by these scholars can best be summarized by quoting Hirst and Brill (1980):

> The integration approach makes pronouns functional elements of discourse and not merely stylistic variants of preceding noun phrases. Repeated noun phrases cannot unambiguously signal integration since they can introduce a new character as well as refer back to an old one. A pronoun, however, always provides an unambiguous signal (P.174).

The argument we want to make in this thesis (and for which we hope to provide empirical support) is that the theory advocated by these scholars is misleading in that it does not take account of some of the factors which we believe have an important role to play in considering the difference (in effectiveness) between pronouns and repeated nouns. These factors are:

1. The 'communicative principles' shared by the speaker and the listener in actual communicative situations.

Two of these principles (the ones relevant here) are:

A. The co-operative principle (Grice, 1967)

B. Message organization principles (ie- how listeners expect the linguistic message to be packaged to them).

2. The distance between the first and the second mentions of the referent (ie- whether or not there are intervening sentences containing other referents between the two mentions of the referent).

3. The status of the antecedent noun phrase through which the first mention of the referent is made (ie-whether the antecedent noun phrase is surface subject or surface object).

A detailed account of how the theory advocated by these scholars must be modified and expanded when the above mentioned three factors are taken into consideration will be given in the following chapter. In the rest of this section, we will give the reader some introductory remarks about the argument we want to make. For the purpose of this discussion, reference will be made form time to time to the quotation given above.

1. Pronouns v. repeated nouns: pragmatic considerations

Hirst and Brill's statement that "repeated nouns cannot unambiguously signal integration since they can introduce a new character as well as refer back to an old one" is misleading in two ways.

A. This statement does not pay attention to language used for communication. In actual communicative situations, the listener assumes, among other things, that the speaker has no intention of misleading him (co-operative principle). Moreover, the notion of 'relevance' put forward by Grice (1967) would dictate continuing on the same topic. If this is so, then it is quite reasonable to assume that the listener will understand that the same referent is being talked about even if the noun is repeated.

B. Countless examples could be cited which contradict this statement. Consider 2 below and compare it with 1 above.

2. President Reagan made a speech on foreign policy.

a. He/b. President Reagan accused the Russians of training international terrorists.

Even if we assume that Hirst and Brill's statement is valid with regard to cases such as 1 above (ie- the individual referred to by the second John may or may not be the same as that referred to by the first John), this argument DOES NOT apply to cases such as 2. In 2, it could not reasonably be argued that the second President Reagan is ambiguous between referring to the same individual as the first President Reagan and referring to a different individual. The second President Reagan DOES refer to the same individual as the first President Reagan.

This is because the referent "President Reagan" is uniquely identified by the expression President Reagan. No other person in the world (the real one) shares this expression with the referent "President Reagan". It follows from this that, in cases such as 2 above, both the pronoun and the noun provide "an unambiguous signal".

Does it follow from our argument in A and B above that the pronoun and the noun (in cases such as 1 and 2 above) are equally effective in signalling integration? The answer to this question must be no. In cases such as 1 and 2 above, the pronoun is more effective than the noun. The differential factor is not that the pronoun, unlike the noun, provides and unambiguous signal but that the pronoun packages the message to the listener more appropriately than the noun. It is a norm in the English-speaking community that (in cases such as 1 and 2 above) listeners expect the pronoun rather than the noun to be used to refer back to the referent in such examples.

2. Pronouns Vs repeated nouns: the distance between the two mentions of the referent.

The quotation given above implies that the pronoun is always more effective than the noun in identifying the referent. We argue that there are some occasions in which the noun is more effective than the pronoun. Our argument runs as follows. If the pronoun is to be more effective than the noun, then the referent must be readily accessible by the time it is referred to by the anaphor. If this condition is not satisfied (ie- if the referent is not readily accessible), then the noun is likely to be more effective than the pronoun.

One factor which affects the availability of referents in memory is whether or not intervening sentences containing other referents separate the two mentions of the referent. Referents whose two mentions are separated by sentences concerned with other referents are likely to be relatively inaccessible. If the pronoun is used to refer back to such referents, then the listener has to search hard before he can identify the referent. On the other hand, the repetition of the noun facilitates the search process.

The repetition of the noun explicitly reinstates the referent in the short-term working memory of the listener. Consider 3 below:

3. Tom visited Cathy.
He had been out of work for 10 months.
He was running short of money.
He had many bills to pay.
She/Cathy lent him 200 pounds.

The referent "Cathy" in 3 is likely to be relatively inaccessible by the time it is referred to again in the last sentence. The intervening sentences which are concerned with a different referent (ie-"Tom") are likely to reduce the amount of initial work-space allocated by the listener to the referent "Cathy". In this case, the repetition of Cathy is likely to be more effective than its pronominal form in identifying the referent for the listener.

3. Pronouns Vs repeated nouns: the status of the antecedent.

The referent "Cathy" in 3 above is introduced in the discourse by a noun phrase functioning as surface object (an object referent) and the referent "Mary" in 4 below is introduced by a noun phrase functioning as surface subject (a subject referent):

4. Mary comforted Tom.

He had been ill for 5 months.

He was living alone.

He owned a small flat in town.

She/Mary spent 3 hours with him.

It has been suggested (cf. Sanford and Garrod, 1978) that, because of their special status, subject referents are likely to be allocated a bigger workspace in memory than object referents. As a result, and by the time the second mention of the referent is made (as in the last sentence in 3 and 4), subject referents (e.g "Mary") are likely to be relatively more accessible than object referents (e.g "Cathy").

If, as we have argued before, the use of the pronoun requires that the referent be readily accessible.and if (in cases such as 3 and 4 above) subject referents are likely to be relatively more accessible than object referents, then for subject referents (as in 4) the pronoun may be as effective as the noun whereas for object referents (as in 3) the pronoun is likely to be less effective than the noun.

To sum up the discussion so far, in this study the following macro-claim is made:

In considering the difference in effectiveness between pronouns and repeated nouns the above mentioned factors have to be taken into account.

A number of hypotheses relating to these factors will be stated in later chapters. To test these hypotheses, three experiments were carried out.

The precise aims of these experiments will be stated in later chapters. The experimental technique adopted was to measure the time the subjects took to indicate that they had understood experimentally-controlled target sentences. The sentences were presented to the subjects in the spoken form. For this reason, the time measured will be referred to as 'listening time'. This time was defined as "the time from the end of the current sentence to when the subject pushes a button to request the next sentence".

1.2 SCOPE OF THE STUDY:

1. The type of constructed discourse in which the difference between pronouns and nouns was investigated is very restricted and could hardly be representative of natural discourse (see 3 and 4 above which exemplify the type of discourse used). The subjects were presented with a number of experimentally-controlled narrative passages consisting of either 2 sentences, 3 sentences or 5 sentences. These passages were constructed by the researcher and were then presented to the subjects in the spoken form. All the sentences in each passage were active sentences. Each passage was followed by a question about one of the sentences in the passage.

2. The first sentence in each passage contained a reference to an individual. This reference was made by a definite noun phrase (a proper name or a definite general noun) functioning as either surface subject or surface object.

3. The last sentence in each passage (the target) contained another reference to the individual referred to in the first sentence. This second instance of reference to the individual was made by either the pronominal form of the antecedent noun phrase or by the full repetition of that noun phrase. Both the pronominal form and the repetition of the antecedent function as surface subjects of the target.

4. In some passages (ie those used in Experiments 1 and 2) no intervening sentences separate the first and the second mentions of the referent. In the remaining passages (those used in Experiment 3) intervening sentences concerned with other referents separate the two mentions of the referent. In half of these passages one intervening sentence containing other referents separates the two mentions of the referent and in the other half three intervening sentences containing other referents separate the two mentions of the referent.

5. In some passages (those used in Experiments 1 and 3), the referent is not uniquely identified by the _____ expression (e.g John ---- he/John). In the remaining passages (those used in Experiment 2) the referent is uniquely identified by the _____ expression (e.g The Queen Mother ------ She/The Queen Mother). The listener may know many people called John or he may assume that this "John" is merely a prototype individual created for the purposes of the experiments. With The Queen Mother, however, there is a reference to an existing individual in the real world identifiable by the listener.

6. No attempt was made in this study to investigate the effect of intonation and stress on the difference between pronouns and nouns.

7. One of the original aims of this study was to compare native speakers' performance to that of non-native speakers of English. However, the results of Experiment 1 (reported in chapter 5) indicated that there was not much point in using non-native speakers' subjects in Experiments 2 and 3. These results showed that the non-native speakers identified the referent faster when the second mention of the referent is made by the repetition of the noun than when it is made by the use of the pronoun.

If this is so, then we would not expect the non-native speakers to do otherwise in Experiment 2 where the referent is uniquely identified by the expression and in Experiment 3 where the two mentions of the referent are separated by intervening sentences containing other referents. Thus, only native speaker subjects were used in Experiments 2 and 3.

1.3 STRUCTURE OF THE THESIS:

The thesis consists of two parts:

PART A: Theoretical chapters:

In addition to the Introduction, this part consists of three other chapters:

Chapter 2: Critical review of the Literature:

This chapter is essentially an expansion of the argument presented in section 1.1 of the introductory chapter.

Chapter 3: Theoretical model:

In this chapter we present a three-way classification of referents. Each of these classifications is based on each of the factors mentioned in chapters 1 and 2. Thus, referents are classified into:

1. Those which are uniquely identified by the expression and those which are not uniquely identified by the expression (pragmatic factor).
2. Those whose two mentions are separated by no intervening sentences and those whose two mentions are separated by intervening sentences containing other referents (distance factor).

3. Those which are introduced in the discourse by a noun phrase functioning as surface subject and those which are introduced by a noun phrase functioning as surface object (the status of the antecedent).

In this chapter we also state (in general terms and without reference to the experimental technique adopted) the predictions tested by the experiments. Thses predictions will be based on the discussion introduced in section 1.1 of the first chapter and expanded in chapter 2.

Chapter 4: Research technique:

This chapter consists of two main sections. In the first section, we describe the "listening time" and the "reading time" measures and discuss the similarities and the differences between the two measures. Some of the problems associated with these measures will also be discussed.

In the second section, we describe three statistical approaches for communicating the results of the research to the reader and show which approach we have adopted. The first of these approaches argues that the researcher should use statistical tests which enable him to generalize his results simultaneously to both the subjects' and the language materials' populations. The second approach argues that, since the first approach requires that the sample of materials used in the experiment should be randomly selected and since, in practice, this is seldom the case, the researcher should treat the language samples as a fixed-effect and seek generalization via non-statistical methods (e.g replication). The third approach offers a compromise between the first and the second approaches.

This third approach suggests a method for reporting the results of experiments in which non-random language samples are used.

PART B: Experimental chapters and conclusion:

Chapter 5: Experiment 1

Chapter 6: Experiment 2

Chapter 7: Experiment 3

Chapter 8: Conclusion

In the first section in each of the experimental chapters, we remind the reader of the definition of the types of referents investigated in each experiment (chapter 3). In this section, we also state the hypotheses tested in each experiment within the framework of the experimental technique adopted (ie in terms of differences in listening time).

The equipment used in the experiments, the experimental procedure .... etc will be described in great detail. A comprehensive analysis of the data of each experiment will be provided. The discussion of the results of each experiment relates the results of the experiment to the views expressed in chapter 2.

In the conclusion, we will relate the results of the experiments as a whole to the main argument of the thesis. Some brief remarks on the implication of this study for teaching the comprehension of anaphoric forms to non-native speakers will be made. This discussion will mainly be based on the results of Experiment 1 where both native and non-native speaker subjects were used. Some ideas for further research will be suggested.

NOTES

1. Discussion in this thesis is limited to consideration of only a restricted set of phenomena. We examine here only noun phrases consisting of simple unmodified definite nouns, proper names and pronouns. We examine a range of phenomena in which pronominal expressions and second-mention definite expressions can only be held to relate back to unambiguous antecedent expressions within the same passage. In the discussion of proper names in Experiment 2, chapter 6, it should be clear that the claims we make about the uniqueness of reference of these expressions relate only to the expressions under discussion here in the political and historical climate of Britain in 1981 when, for instance, it can reasonably be claimed within Britain that for the majority of population expressions like Mrs. Thatcher and the Queen Mother will have immediate successful and unique reference. It is clearly the case that the Queen Mother could be used as an expression to refer to a 17th century individual etc.

There is a sense in which discussion of reference in this thesis could be claimed only to be properly operative with respect to the discussion of proper-name reference in Experiment 2. It can hardly be claimed that expressions like the boy or John as used in experimental conditions in invented citation texts read aloud by uninvolved readers can be held to 'refer'. It has to be assumed, however, in laboratory conditions like these, that subjects behave as they would if reference were really involved.

CHAPTER TWO

CRITICAL REVIEW OF THE LITERATURE

2.0 AIMS AND STRUCTURE:

In this chapter, we present the ideas of various scholars who have written directly or indirectly about the difference between anaphoric pronouns and anaphoric repeated nouns. The discussion will mainly be presented from the listener's point of view. The chapter consists of four major sections. In section one, we will approach the issue of the difference between pronouns and repeated nouns from a purely linguistic point of view. In the following three sections, we will demonstrate in some detail how the account given in the first section could be modified and expanded when the pragmatic and the psychological factors mentioned in chapter one are taken into consideration.

2.1 PRONOUNS AND REPEATED NOUNS: LINGUISTIC CONSIDERATIONS

2.1.1. Bloomfield (1933)

Bloomfield regarded the pronoun (as in a. below) as a substitute and he defined a substitute as "a linguistic form or grammatical feature which, under certain conventional circumstances, replaces any one of a class of linguistic forms" (p.247).

1. Jane missed the bus. a. She/b. Jane went to school on foot.

Commenting on the meaning of substitutes Bloomfield wrote:

> Since, aside from the **class**-meaning, the substitution-type represents the whole meaning of a substitute, we can safely say that the meanings of substitutes are, on the one hand, more inclusive and abstract, and, on the other hand, simpler and more constant, than the meanings of ordinary linguistic forms. In their class-meaning, substitutes are one step further removed than ordinary forms from practical reality, since they designate not real objects but grammatical form classes; substitutes are, so to speak, linguistic forms of the second degree. In their substitution-type, on the other hand, substitutes are more primitive than ordinary linguistic forms, for they designate simple features of the immediate situation in which the speech is being uttered. (p.250)

By saying that the meanings of substitutes are "simpler and more constant" than the meanings of ordinary linguistic forms, Bloomfield meant that the referent of a lexical item like Jane in 'b' above may or may not be the same as that of the lexical item Jane in '2' above whereas the referent of a pronoun like She in 'a' is the same as that of Jane in '2'. On the usefulness of substitutes Bloomfield wrote:

> The practical usefulness of substitution is easy to see. The substitute is used more often than any one of the forms in its domain; consequently, it is easier to speak and to recognise. Moreover, substitutes are often short forms and often, as in English, atonic, or, as in French, otherwise adapted to quick and easy utterance. In spite of this economy, substitutes often work more safely and accurately than specific forms. In answer to the question Would you like some fine, fresh cantaloupes? The answer How much are cantaloupes? is perhaps more likely to be followed by a delay or aberration ("misunderstanding") than the answer How much are they? (p.250)

2.1.2 Crymes (1968)

Like Bloomfield, Crymes also regards the pronoun (as in 'a' above) as a substitute and She defines a substitute in the same way as Bloomfield did. Moreover, Crymes takes the view that pronouns are superior to repeated nouns in signalling to the listener that an anaphor and its antecedent share a common referent:

> For a word to be classed as a substitute, it must in fact "stand for" an item which could occur in the same position but which does not do so because such occurrence would hinder either dispatch or clarity or both. For example, in if you see a postman, will you give him this letter, him is a substitute replacing the postman, which is potentially occurrent though its occurrence would be wasteful of words and uncommon enough, even, perhaps to detract the listener from the message. And in When the boy comes, give him the letter, occurrence of the replaced the boy would open the sentence to two interpretations - are there two boys or is there one? Substitutes serve dispatch because the lexical information that they carry is less than that carried by replaced items; they serve clarity because the grammatical information that they carry is more." (p. 31-32)

2.1.3 Lesgold (1972)

Evidence from the literature which supports the view that pronouns work better than repeated nouns was reported by Lesgold. In a paper to which he gave the title Pronominalization: A Device for Unifying Sentences in Memory, Lesgold argues that in order for propositions to be connected in memory, they must not only have items in common but also have those communalities flagged in the surface structure of the sentence. Pronominal reference was proposed to function as such a flag which marks portions of linguistic input that can be stored as a single memory unit. As Lesgold puts it:

> Pronouns can be conceived of as sentential cues that indicate the sharing of lexical items by more than one underlying propositions. In fact, they are such common and useful cues that sentence forms in which a noun is repeated (rather than pronominalized) have very special functions. (p. 230)

To test his theory, Lesgold presented his subjects with sentences like 2 and 3 below:

2. The blacksmith was skilled and the anvil was dented and the blacksmith pounded the anvil.

3. The blacksmith was skilled and he pounded the anvil which was dented.

The sentences were divided in a number of blocks with each block consisting of 5 sentences. Each block was presented separately to the subjects with each sentence being shown for 5 seconds. The subjects were given recall sheets which contain a prop word form each of the sentences and they were instructed to write each sentence's content next to that sentence's prop word. The subjects were told that only meaningful content, or gist, was required and the exact recall would be scored no higher than complete content recall.

As Lesgold predicted, sentences like 4 showed better interpropositional integration than sentences like 3.

Integration was defined as "an equal likelihood of recall for lexical items in the same versus other underlying sentence propositions." (p.320)

In simple language, the subjects were able to relate two items to the same concept better when the second item is a pronominal form of the first item (e.g. The blacksmith ..... He) than when it is the repetition of the first item (The blacksmith ..... The blacksmith).

2.1.4 Halliday and Hasan (1976)

Unlike Bloomfield and Crymes, Halliday and Hasan characterize the cohesive 'tie' between sentences such as '4' and 'a' below as that of the type "endophoric anaphoric reference" and that between sentences such as '4' and 'b' below as "lexical cohesion" of the type 'reiteration: same word (repetition)':

4. John found the missing girl. a. He/b. John immediately phoned the nearest police station.

The point that concerns us most here is that like Bloomfield, Crymes and Lesgold, Halliday and Hasan take the view that pronouns are more effective than repeated nouns in identifying the referent for the listener:

> All the types of lexical cohesion that we have considered up to this point have involved identity of reference; no matter whether the reiterated item has been a repetition, a synonym, a super-ordinate or a general word, it has been assumed to share a common referent with the original. Keeping to this assumption for the moment we can shift our point of view from the grammatical to the lexical and look at reference from the lexical angle, interpreting it as a means of avoiding the repetition of lexical items and thus making it clear that if the lexical item had been reiterated it would have had the same referent.
> The simplest illustration of this is provided by proper names. Suppose we have
> [6.9] John took Mary to the dance. John was left all alone. - how do we know whether it is the same John? The answer to this, if you want to make it clear that it is the same John, don't call him John; call him he. In other words, we use a reference item; and this conveys the meaning 'the present sentence is related to the last one by the fact that both contain a reference to the same individual'. This does not mean that a repeated proper name can never have the same referent as it had on its first occurence; the second John COULD refer to the same person as the first - we simply do not know whether it does or not. If John is repeated, we need some further signal to tell us how to interpret it. (p.281)

The same point is again stressed by Halliday and Hasan:

> Why do we refer to 'John' as him rather than as John? Because John is vague, whereas him is definite. John could be any old John, but him means 'that particular individual whose identity we have established and agreed upon'. We refer to John as him rather than as John in order to signal that his identity is the feature of the environment. And the same principle applies to the other reference items. The environment has been extended from the situation to include the text. (p.306)

Consistent with their view that pronouns are more efficient than repeated nouns in signalling to the listener that an anaphor and its antecedent share the same referent, Halliday and Hasan characterize the pronoun (as in 'a' above) as being explicitly anaphoric whereas they characterize the repeated noun (as in 'b' above) as being implicitly anaphoric:

In the system:	a	b
In the text:	a	b
	(time)	
implicitly anaphoric	John 1	John 2
explicitly anaphoric	John	he
(explicitly) cataphoric	he:	John (p.19)

2.1.5 Richek (1976 - 1977):

The difference between pronouns and repeated nouns was also investigated by Richek. In addition to these two anaphoric forms, a third anaphoric form (the null form) was also included in the study. Richek, unlike Lesgold, was concerned with the school-age child's comprehension of these anaphoric forms. Her argument concerning the difference between pronouns and repeated nouns must, therefore, be seen within this context. According to Richek, the less information an anaphoric form contains, the more difficult it would be to comprehend. Her hypothesis was, therefore, that the noun form would be most comprehensible and that the pronoun and the null forms would be associated with successively decreasing comprehension levels.

To test her hypothesis, Richek presented third grade children with sentences like 5, 6 and 7 below:

5. Noun: John saw Mary and John said hello to Mary.

6. Pronoun: John saw Mary and he said hello to her.

7. Null: John saw Mary and said hello to her.

After reading the sentences, the subjects were asked to supply the antecedents for the anaphoric forms. The anaphoric form questioned in the test was either the subject or the object reference, as illustrated in 8 and 9 below:

8. Subject: John saw Mary and he said hello to her.

Who said hello to her?

9. Object: John saw Mary and he said hello to her.

To whom did he say hello?

As Richek expected, noun forms were easiest,pronoun forms next most comprehensible, and null forms least comprehensible. Moreover, the node questioned was also found to affect comprehension - object nodes being more difficult to produce. To explain these results, Richek wrote:

> Such results support the contention that the school-aged child's understanding of syntax is incompletely developed. Frequency of exposure to a syntactic pattern does not appear to be reflected in ease of comprehension. According to the sample of two texts, children see the null and the pronoun forms far more frequently than the noun forms. Rather indications are that performance depends on the amount of information available to the reader. (p.159)

2.1.6 Summary of section 2.1:

Halliday and Hasan, Crymes, Bloomfield and Lesgold share the view that pronouns are more efficient than repeated nouns in signalling to the listener that an anaphor and its antecedent share a common referent. The resuls of Lesgold's experiment seem to support this view. The pronoun signals to the listener that its referent is the same as that of the antecedent.

When the noun is repeated, on the other hand, the listener will not be able to know for sure whether the referent of the second occurence of the noun is the same as that of its first occurence. Richek explained the results of her experiment in terms of the incomplete syntactic competence of the school-age children used in the experiment. The implication is that once these children develop a complete mastery of English syntax they would probably find the pronoun easier to comprehend than the repeated noun.

As we have mentioned in the preceding chapter, the theory advocated by these scholars is misleading in that it does not take into account at least three factors which, if taken into consideration, as they should be, would modify and expand this theory. In the remainder of this chapter, we will show in some detail how this theory must be modified and expanded when these three factors (listed in chapter one) are taken into consideration. The effect of the first factor (the pragmatic factor) on the difference between pronouns and repeated nouns will be discussed in section 2.2. The effect of the second factor (the distance between the antecedent and the anaphor) will be discussed in section 2.3 and that of the third factor (the status of the antecedent) will be discussed in section 2.4.

2.2 PRONOUNS AND REPEATED NOUNS: PRAGMATIC CONSIDERATIONS

2.2.1 The role of the Co-operative Principle

As has been mentioned in the first chapter, the view that repeated nouns, unlike pronouns, are ambiguous between referring to the intended referent and referring to a different referent pays no attention to the use of language in actual communicative situations. In particular, this view seems to ignore the notion of co-operative conversation which Grice (1967) put forward.

According to Grice, in actual communicative situations there is a general agreement of co-operation between the speaker and the listener. Grice uses the term 'the co-operative principle' to refer to this agreement. Under this general term, Grice isolates a number of general maxims which specify the conventions which participants in a conversation should obey. The maxims of most relevance to our purposes are listed below:

1. Relation

Be relevant.

2. Manner

This maxim has an over-all instruction 'Be perspicuous'. Grice subdivides this general instruction into four further maxims:

A. Avoid ambiguity

B. Avoid obscurity

C. Be orderly

D. Be brief

The listener assumes that the speaker will adhere to the maxims of Relation and Manner. In the case of the first maxim, the listener expects the speaker to be relevant by continuing to speak on one topic and to mark when he shifts to another topic. In the case of the second maxim, the listener assumes that the speaker does not intend to be ambiguous, obscure or disorderly. If this is so, then it is likely that the referent of the second occurence of the noun will be understood by the listener as being the same as that of its first occurence.

2.2.2 Cases where the referent is uniquely identified by the expression

In addition to paying no attention to the role of the co-operative principle in the interpretation of discourse, this argument against noun repetition does NOT apply to those cases in which the referent is uniquely identified by the expression. As an illustration of this point, consider 11 below and compare it with 10:

10. John took Mary to the dance. He/John was left all alone.

11. Pope John Paul II addressed the United Nations' General Assembly last year. He/Pope John Paul II spoke against an arms race and in favour of peace.

Since there is only one person in the world who is called Pope John Paul II, the listener would have no doubt that the second Pope John Paul II refers to the same individual as the first Pope John Paul II. It is relevant at this point to recall Bloomfield's misleading observation that the meaing of substitutes (e.g. He in 10) is more constant than the meaning of lexical items (e.g. John in 10). This observation would certainly not apply to examples such as 11 above. The meaning of the second Pope John Paul II is as constant as the meaning of the pronoun He in 11. In order to further clarify to the reader that the argument made by Halliday and Hasan, Bloomfield, Crymes and Lesgold against noun repetition would not apply to examples such as 11, let us quote once more what Halliday and Hasan said about 10 but substituting John Paul II for John:

1. - how do we know whether it's the same John Paul II? The answer to this, if you want to make it clear that it is the same John Paul II, don't call him John Paul II; call him he.

In other words, we use a reference item; and this conveys the meaning 'the present sentence is related to the last one by the fact that both contain a reference to the same individual'. This does not mean that a repeated proper noun can never have the same referent as it had on its first occurrence the second John Paul II COULD refer to the same person as the first - we simply do not know whether it does or not. If John Paul II is repeated, we need some further signal to tell us how to interpret it .

2. Why do we refer to 'John Paul II' as him rather than as John Paul II? Because John Paul II is vague, whereas him is definite. John Paul II could be any old John Paul II; but him means 'that particular individual whose identity we have established and agreed upon .

To sum up the discussion on example 11 we say that:

A. John Paul II as well as he would make it clear to the listener that the same individual is being talked about.

B. John Paul II as well as he conveys the meaning 'the present sentence is related to the last one by the fact that both contain a reference to the same individual'.

C. The second John Paul II DOES refer to the same individual as the first. We need no further signal to tell us how to interpret it.

D. John Paul II is as definite as he.

2.2.3 The role of 'Message organization principles'

The argument in sub-section 2.2.1 and 2.2.2 does not mean that the pronoun and the noun (in cases such as 10 and 11 above) are equally effective. In such cases, the pronoun IS more effective than the noun. The reason for this is not that the noun, unlike the pronoun, is ambiguous. The reason is that the pronoun packages the message more appropriately than the noun in examples such as 10 and 11. As has been mentioned in the first chapter, it is an established norm in the English-speaking community that (in cases such as 10 and 11) the pronoun rather than the noun should be used.

Discussing the formal realizations of various aspects of information structure, Halliday [1967] distinguishes between 'unmarked' and 'marked' realization forms. Thus, for example, a distinction is made between 'unmarked' and 'marked' realizations of 'information focus'. As he put it:

> A distinction may therefore be made between unmarked focus, realized as the location of the tonic on the final accented lexical item, which assigns the function 'new' to the constituent in question but does not specify the status of the remainder, and marked focus, realized as any other location of the tonic, which assignes the function 'new' to the focal constituent and that of 'given' to the rest of the information unit. [p.208].

An analogy could be made between the location of the tonic on the final accented lexical item as opposed to any other location of the tonic and the use of the pronoun as opposed to the noun in cases such as 10 and 11 above. In the same way as the former location of the tonic represents the 'unmarked' realization whereas the latter location of the tonic represents the 'marked' realization, we suggest that the use of the pronoun [in cases such as 10 and 11 above] represents the 'unmarked' option whereas the use of the noun represents the 'marked' option. The 'marked' form [the use of the noun] will, in principle, be used in situations where the speaker thinks that the listener will be able to understand the 'communicative' meaning conveyed by this markedness (see 2.2.4. below).

2.2.4. Markedness in message organisation

Bolinger, (1977, 1979) argues that pronominalization of one NP by another is a misleading concept and that we should rather ask what reason a speaker has for identifying the referent at a given point with a particular fullness of semantic features. According to Bolinger, non-deictic personal pronouns probably always relate, literally or figuratively, to a NP previously introduced or at least well known. If there is a coreferential noun to the right, it answers to some need at that point for more semantic information than the bare minimum.

Bolinger mentions various cases in which the speaker may repeat (rather than pronominalize) the noun. One of these cases is that the speaker repeats the noun in order to emphasize the nature of the referent (X qua X; X has the quality suggested by the clause in which X occurs). Bolinger gives various examples to illustrate this point. One of these examples is given here as 12:

12. When Joe enters a conversation, Joe expects Joe's friends to listen to Joe.

On 12, Bolinger writes "we gather that Joe is just naturally self-centred" and "repeated Joe refers to that person". Halliday and Hasan, Crymes, Bloomfield and Lesgold would argue that the listener would only know for sure that the individual being referred to is one and the same "Joe" if 13 rather than 12 is used:

13. When Joe enters a conversation, he expects his friends to listen to him.

As we have argued in the previous sub-section, the difference between examples such as 13 and examples such as 12 is a difference between examples in which the message is appropriately packaged to the listener (e.g. 13) and examples in which the message is not appropriately packaged to the listener (e.g. 12).

Gillian Brown (personal communication) suggested that the problem with Bolinger's position is that he does not make it clear that his examples are highly marked in the sense that they can only be used when message organization is deliberately marked by the speaker so that the listener shall recognize the communicative motives behind this markedness.

Within this context, the repetition of Joe in 12 may convey the meaning "Joe is full of Joe". It is perhaps of interest to mention that had Bolinger used examples such as 14 below to illustrate his point then the objections which are likely to be raised by Halliday and Hasan and the others against his argument would no longer be valid:

14. When Mrs. Thatcher is interviewed on television, Mrs. Thatcher expects Mrs. Thatcher's interviewer not to interrupt Mrs. Thatcher.

Perhaps, 14 would emphasize not only Mrs. Thatcher's 'nature' but also her role or status.

2.2.5 Summary of section 2.2.

1. In theory (ie when language is abstracted from communicative context), the repetition of the noun is ambiguous between referring to the intended referent and referring to a different referent. We may refer to this ambiguity as "structural ambiguity". In practice (ie when language is considered, as it should be, within a communicative context), the repetition of the noun unambiguouslyidentifies the referent for the listener. The Co-operative principle to which participants in the discourse normally adhere disambigutes the "structural ambiguity" of the noun. In the interpretation of discourse, "communicative rules" play a much more important role than "structrual rules".

2. The view that nouns, unlike pronouns, are ambiguous is inconsistent with cases in which the referent is uniquely identified by the expression. In such cases, both the pronoun and the noun unambiguously identify the referentfor the listener (e.g. The Queen Mother .... She/ The Queen Mother).

3. The theory presented in section 2.1 would predict that the noun would be as effective as the pronoun when the referent is uniquely identified by the expression. We have argued that the pronoun would be more effective than the noun even when the referent is uniquely identified by the expression. The difference between the pronoun and the noun (in the cases we have considered so far) should be viewed as a difference between a form which appropriately packages the message to the listener (ie the pronoun) and a form which does not do so (ie the noun).

4. Message organization may be deliberately marked by the speaker so that the listener shall recognize the 'communicative' meaning conveyed by this marked form. In such cases (e.g. Bolinger's example), the repetition of the noun may convey some 'communicative' meaning in addition to its 'cognitive' meaning.

2.3 PRONOUNS AND REPEATED NOUNS: THE DISTANCE BETWEEN THE ANTECEDENT AND THE ANAPHOR

2.3.1 Chafe (1972, 1974)

To show how the theory presented in section 2.1 must be modified when the distance between the antecedent and the anaphor is taken into account, let us present a notion which was introduced by Chafe and to which he gave the name 'foregrounded'. According to Chafe:

> At any one point in a discourse there are certain concepts which are in the foreground of the minds of the participants in the discourse - concepts which are, so to speak, in sharp focus at that point. To use another metaphor, we might think of what is going on in a discourse as if it described states and events unfolding on a stage. We would then say that at any particular point in the discourse there are certain things which are "on stage". It is what-ever is on stage that I am calling foregrounded. (p. 50, 1972)

More recently Chafe (1974) came to the conclusion that what is involved here is an assumption by the speaker that the material in question is presently in the consciousness of the hearer. 'Foregrounded', therefore, can be understood as an abbreviated label for assumed to be in the hearer's consciousness.

Lesgold et al (1979) use the term 'backgrounded' to refer to concepts which are not assumed by the speaker to be in the hearer's consciousness at a particular point in the discourse.

One surface manifestation of foregrounding is pronominalization and, although Chafe does not explicitly say how backgrounding is realized, he seems to imply from the examples he gave that it is realized by repeating the noun which was used to introduce the concept in question earlier in the discourse. If a speaker assumes that the concept X is not presently in the consciousness of the hearer (ie backgrounded), then the ideal thing for him to do is to reinstate that concept into the activated memory of the hearer by repeating the noun through which the concept in question was introduced earlier in the discourse. Pronominalization would not be helpful in this case. As we have mentioned in the first chapter, if the pronoun is used to refer back to a relatively inaccessible (ie backgrounded) referent, then the listener has to search hard before he can identify the referent.

A major problem with the notions of 'foregrounded' and 'backgrounded' is that the limit between them cannot be pinned down in any satisfactory way. The problem is that we do not seem to be able to say precisely when a speaker must henceforth treat a concept as no longer foregrounded.

But as Chafe suggested:

> One has the impression that foregrounding tends to evaporate gradually as more and more sentences are uttered in which the foregrounded item does not appear. Seemingly, however, it is not just a matter of the number of sentences, but also of change of scene, the introduction of new events not involving the foregrounded items, and so on. The longer a concept is on stage without having any part in the action, the more likely it is to retreat into the wings. (p. 52, 1972)

If foregrounding tends to evaporate gradually as more and more sentences are uttered in which the foregrounded concept does not have any part in the action, up to a point where that concept becomes backgrounded, and if foregrounding is closely associated with pronominalization, whereas backgrounding is closely associated with noun repetition, then we could say that pronouns are superior to repeated nouns in identifying the concept (or the referent) for the listener when there are no intervening sentences between the first and the second mention of the concept (ie when the concept is foregrounded) but that this superiority of pronouns over repeated nouns would decrease gradually with the increase in the number of intervening sentences in which the concept in question does not appear up to a point where the repeated noun would in fact be superior to the pronoun. As an illustration of this point consider the following examples:

15. John scored the goal. a. He / b. John was absolutely delighted.

16. John scored the goal. It came 10 minutes before the end of the match. a. He / b. John was absolutely delighted.

17. John scored the goal. It came 10 minutes before the end of the match. It was a header. a. He / b. John was absolutely delighted.

18. John scored the goal. It came 10 minutes before the end of the match. It was a header. It was a fine goal. a. He / b. John was absolutely delighted.

In 16, one sentence separates the first and the second mention of the referent 'John'. This sentence, in which 'John' does not play a part in the action, has the effect of making 'John' less foregrounded in 16 than in 15, where no sentences separate the first and the second mention of the referent. If 'John' is less foregrounded in 16 than in 15, then we would expect the superiority of the pronoun he in 16a over the repeated noun John in 16b (in identifying the referent for the listener) to be less than that of the pronoun he in 15a over the repeated noun John in 15b.

In 17, two sentences separate the first and the second mention of 'John'. Assuming that 'John' is still in the consciousness of the listener when he is mentioned again, we would expect him to be less foregrounded in 17 than in 16. If this is the case, then we would expect the superiority of the pronoun he in 17a over the repeated noun John in 17b to be less than that of he in 16a over John in 16b.

In 18, three sentences separate the first and the second mention of 'John'. If 'John' is still foregrounded when he is mentioned for the second time, we would expect him to be less foregrounded in 18 than in 17. Consequently, we would expect the superiority of he in 18a over John in 18b to be less than that of he in 17a over John in 17b. If, on the other hand, 'John' is no longer in the consciousness of the listener after three intervening sentences (ie backgrounded), then we would expect the repeated noun John in 18b to be superior to the pronoun he in 18a.

2.3.2 Bolinger (1977, 1979):

Another reason given by Bolinger for repeating the noun is that the speaker repeats the noun in order to reidentify a prior referent that is distant in space. Bolinger quoted Keenan's remark (1976) that "the closer they get the harder it is to have a repetition of the full NP". This remark is similar to the observation we have made in the previous sub-section that when there are no intervening sentences (when the two NPs are close to each other), the pronoun is superior to the repeated noun but that this superiority of the pronoun over the repeated noun would decrease gradually with the increase in the number of intervening sentences up to a point where the repeated noun would become superior to the pronoun ie. when the listener needs to be reminded of the referent. Note that, however, whereas we speak of the distance between the two NPs in terms of intervening sentences in which the referent is not mentioned, Bolinger seems to speak of the distance between the two NPs in terms of other intervening referents within the same sentence. The examples given by Bolinger to illustrate his point are given below as 19 and 20:

19, Tom turned all his friends against him himself.

20. Tom turned all his friends against Larry, Jerry, and Tom himself.

On 20, Bolinger commented that "By the time the second Tom is reached the hearer needs to be reminded, and the speaker may himself have lost the thread". In other words, the intervening referents "Larry" and "Jerry" have the effect of making "Tom" no longer available in the hearer's consciousness and, therefore, the noun is repeated (rather than pronominalized) in order to remind him of the referent.

In 19, on the other hand, "Tom" is most likely to be in the hearer's consciousness when he is mentioned again and, therefore, the noun is pronominalized rather than repeated.

2.3.3. Yule (1980):

Yule was concerned with the different circumstances in which one realization form is used rather than another to refer to an established referent in a limited domain of discourse. Yule claimed that, at any point in the discourse he investigated, there is a current non-new entity and other displaced non-new entities. The current non-new entity is the most recent 'new' entity to have been established in the discourse and displaced non-new entities are, at any point, those which have been established previously in the discourse. There is, then, a process in the type of discourse investigated by Yule whereby an entity is introduced as 'new', is consequently referred to as the current 'non-new' when the next 'new' entity is introduced, and becomes the displaced 'non-new' entity when a further 'new' entity is introduced. The example given by Yule to clarify this process is given below as 21:

21. in the middle of the page draw a black triangle + + / / underneath the triangle + draw a red line about two inches + + / / and at the right hand side of this line write ON in black + +

The first entity introduced as 'new' in 22 is "a black triangle". At this point in the discourse, the 'non-new' entity "the page" (non-new by virtue of its physical presence in the situation) is current 'non-new'. The second entity introduced as 'new' is "a red line about two inches". At this point in the discourse, the entity "the triangle" is current 'non-new' whereas "the page" becomes the displaced 'non-new'.

The third entity introduced as 'new' is "ON". At this point in the discourse "this line" is current 'non-new' and both "the triangle" and "the page" are displaced 'non-new'.

To discover whether the expressions referring to current and displaced non-new entities differ in terms of their formal realization, Yule conducted an exercise in which a group of pairs of undergraduates were asked to take part. Participant A had a drawing (of lines, triangles, squares or circles) in frontof him which participant B could not see. B had a blank sheet of paper, a black pen and a red pen. A was required to tell B what was in the drawing in such a way that B could reproduce the drawing as accurately as possible. B was allowed to ask questions.

The results of Yule's investigation could be summarized as follows:

1. 'New' entity - referring expressions tend to have a consistent realization form, primarily identifiable by the presence of the indefinite article (e.g. a black triangle).

2. The most 'neutral' form of non-new entity reference apparently involves a repetition of the 'e - element' (i.e. the nominal in the entity - referring expression) with the definite article (e.g. 'the line'). It is used equally for both current and displaced entity reference. On this finding Yule wrote:

> I think such a finding is generally in line with Chafe's proposal (1976:39) that 'definiteness' is an aspect of language use essentially independent of the relationship 'new-non-new' which exists in discourse. A singular definite noun phrase is consistently used for any referent which is considered by the speaker to be 'identifiable' by the hearer . (p.8)

3. The use of repeated lexical items is more frequent for displaced entity reference than for current entity reference.

4. The use of 'attenuated' forms (e.g. it, Ø) is much more frequent for current entities than for displaced entities.

5. For current entities the use of 'attenuated' forms is much more frequent than the use of repeated lexical items whereas for displaced entities the opposite is true.

In summary, the findings of Yule's investigation (especially the last one) seem to support the view we have expressed earlier that the pronoun (an attenuated form) will be superior to the repeated noun if the concept is foregrounded whereas the repeated noun will be superior to the pronoun if the concept is backgrounded.

2.3.4 Clark and Sengul (1979):

Clark and Sengul argue that the availability of a referent in memory depends on where and how it was mentioned in the prior discourse. Consider the example given by Clark and Sengul to illustrate this point:

22. (1) Yesterday I met a woman who had written a book on viruses. (2) She had studied them for years and years. (3) It was selling very well.

On this example Clark and Sengul wrote:

> The pronoun "She" in sentence 2 refers to the woman mentioned in sentence 1; its referent seems easy to identify. The pronoun "it" in sentence 3 refers to the book mentioned in sentence 1; its referent seems more difficult to identify. What is the difference? Informally, it looks as if a referent is readily identifiable if it was mentioned one sentence back. It seems less available for identification if it was mentioned two sentences back. Notice how much easier "it" becomes when sentence 3 comes right after sentence 1, so that its referent is mentioned just one sentence back." (p.35-36)

Clark and Sengul proposed two models to account for the process of searching for antecedents of anaphoric nouns and pronouns.

The first of these models is what they call the "continuity model" and the second is what they call the "discontinuity model". On the first model they wrote:

> In the "continuity model", the entities mentioned in a discourse are laid down in memory like beads on a string. The entities are strung one by one as they are mentioned in the discourse. When listeners try to identify the referent of a noun or a pronoun, they search these beads from the final one backward. The further back they have to search, the longer they should take and the slower they should be in understanding the present sentence. (p.36)

On the "discontinuity model" Clark and Sengul wrote:

> The "discontinuity model" is like the continuity model except that it has two strings of beads instead of one. The first, and privileged, string contains the entities mentioned in the current sentence and one sentence back, while the second string contains the entities mentioned two or more sentences back. The entities for the first sentence back are transferred to the second string when the current sentence is completed, and so all that remains on the first string are the entities from the just-completed sentence. The premise of this model is that the first string, the entities mentioned in the current sentence and one sentence back, has a privileged place in working memory and so readily available for examination, for search and identification. The second string is not in working memory and takes extra time and effort to examine. Part of this string may even lose its identifiability. As the name suggests, therefore, the discontinuity model predicts a discontinuity in the search process. Referents will be identified readily only if they are mentioned in the current sentence or one sentence back. (p. 36)

Clark and Sengul went on to say that some entities may be granted a privileged status in working memory not by virtue of their mention in the last sentence but by virtue of their thematic function. These entities include such things as the topic of the discourse, the scene, and other generally assumed facts, like the identities of the speaker and listeners.

To test the claim that the entities mentioned one sentence back have a privileged status in memory and to find out whether the search for referents is the same for nouns and pronouns, Clark and Sengul conducted an experiment in which the subject (1) read a three-sentence context paragraph presented in a tachistoscope, (2) pressed a button when he had completed it, (3) read a target sentence presented immediately afterward, and (4) pressed a button when he felt he understood that.

The target sentence contained either a noun or pronoun whose referent has been mentioned in sentence 1, 2 or 3 of the context paragraph. If, as the discontinuity model claims, the entities mentioned in sentence 3 have a privileged status in working memory, then comprehension of the target sentence should be fast when the referent is mentioned in sentence 3, but slow when it is mentioned in sentence 1 and 2. The context paragraph always read like a simple description in which the three sentences had no intrinsic order. The paragraph mentioned the referent to the target nominal only once and made no other implicit reference to it. In all paragraphs, there were mentions of concepts that could serve as referents to other nouns or pronouns, so the subject could not readily guess which one would be referred to later. The first mention of the referent was always indefinite. An example of the materials used in the experiment is given below as 23 (the reference in sentence 3 is underlined):

23. (Context) A broadloom rug in rose and purple colours covered the floor. Dim light from a small brass lamp cast shadows on the walls. In one corner of the room was an upholstered chair. (Target) The chair appeared to be an antique.

As Clark and Sengul predicted, the target sentence was comprehended quickly when the referent was mentioned in sentence 3 of the context paragraph, but equally slowly when it was mentioned in sentence 1 or 2. The nouns and the pronouns were alike, with no reliable differences in their means or interactions. The main finding, then is that there is a clear discontinuity in the latencies. The target sentence becomes distinctly harder to understand when the referent is more than one sentence back.

The finding by Clark and Sengul that the pronoun was not faster than the noun when the referent was mentioned in sentence 3 may be due to the following reasons:

A. It is quite normal to use a definite noun phrase to refer back to a referent which has been introduced in the discourse by an indefinite noun phrase (e.g. a chair ..... the chair/ see Yule (1980)). As we have mentioned in the first chapter, in this study we are only concerned with those cases in which the two mentions of the referent are made by a definite noun phrase (e.g. the chair .... the chair).

B. In Clark and Sengul's experiment, the referent of the pronoun, unlike that of the noun, seems to be ambiguous. Consider once more 23 which was given by Clark and Sengul as an example of the materials used in the experiment. The counterpart of the target sentence in this example was It appeared to be an antique. The referent of it, unlike that of the chair, could be "the chair", "the lamp" or "the rug". Thus, it is quite likely that the subjects found it difficult to interpret the referent of the pronoun simply because they were unable to tell whether the pronoun refers to this or that referent.

2.3.5 Lesgold et al (1979):

On the basis of the theory presented by Chafe (1972), Lesgold et al hypothesized that sentences take longer to understand when they refer only to information presented earlier but currently backgrounded. To test this hypothesis, a number of passages were constructed. All of the passages began with an introductory segment of several sentences which described the setting of the passage and contained antecedent information for a target sentence. The target sentence was not shown until after the rest of the passage had been read.

Three foregrounding (F - 0, F - 2, and F - 4) and three backgrounding (B - 2, B - 4, and B - 22) conditions were produced by varying the number and content of sentences which came after the critical antecedent information. In condition F - 0, no additional material was added (e.g. sentence 24 below was the last sentence seen before sentence 25 appeared):

24. A thick cloud of smoke hung over the forest.

25. The forest was on fire.

In condition F - 2, two sentences were added which kept the critical information in the foreground. In condition F - 4, four sentences were added which preserved the foregrounded topic.

In the three backgrounding conditions, the interjected material was irrelevant to the target-antecedent content of the introductory segment. In condition B - 2 and B - 4, the intervening sentences dealt with one irrelevant topic. In condition B - 2, two sentences on one irrelevant topic were inserted, and in condition B - 4, four sentences on one irrelevant topic were added. In condition B - 22, four sentences were also interjected, but these sentences encompassed two different new topics. As Lesgold et al predicted, the three foregrounding conditions were significantly faster than the three backgrounding conditions. Within the F conditions and within the B conditions, there were no significant pairwise differences. The finding that the F conditions were faster than the B conditions is similar to the finding by Clark and Sengul that the target sentences were understood faster when the referent was mentioned one sentence back than when it was mentioned 2 or 3 sentences back.

2.3.6 Summary of section 2.3:

1. For the pronoun to be more efficient than the repeated noun in identifying the referent for the listener, it is not sufficient that the referent in question has already been mentioned in the preceding discourse. It is essential that this referent be in the consciousness of the listener (ie foregrounded) when it is referred to again by the anaphor. If this latter condition is not satisfied (ie if the referent is backgrounded), then the repeated noun would be more efficient than the pronoun.

2. We do not know exactly the point in a discourse at which the referent becomes no longer foregrounded and, therefore, we do not know exactly the point at which the pronoun would no longer be more efficient than the repeated noun. All we can say now is that the less foregrounded the referent becomes, the less likely that the pronoun will be more efficient than the repeated noun. Put differently, the less foregrounded the referent becomes, the more likely that the repeated noun will be superior to the pronoun.

3. Possibly, the referent will gradually retreat "into the wings" as more and more sentences are uttered in which the referent has no part in the action (Chafe, Clark and Sengul, and Lesgold et al). A similar suggestion is that the referent will gradually retreat into the wings as more and more other new referents were introduced (Bolinger, Yule).

4. If it is likely that the more sentences are uttered in which the referent is not mentioned, the less foregrounded the referent becomes, then we could say that pronouns are superior to repeated nouns when there are no intervening sentences but that this superiority of pronouns over repeated nouns will decrease gradually with the increase in the number of intervening sentences up to a point where repeated nouns will be superior to pronouns (ie when the referent is no longer

foregrounded).

5. The results of the experiments performed by Clark and Sengul, and Lesgold et al showed that the referents of pronouns and repeated nouns are easier to identify if these referents are foregrounded than if they are backgrounded.

2.4 PRONOUNS AND REPEATED NOUNS: THE STATUS OF THE ANTECEDENT:

2.4.0 Aims and structure of the section

In the previous sections, we have argued that:

A. When no intervening sentences containing other referents separate the two mentions of the referent, the pronoun will be more effective than the noun in identifying the referent for the listener.

B. The more intervening sentences in which the referent is not mentioned are uttered, the less likely that the pronoun will be more effective than the noun.

In all the examples given to illustrate these two points, the first mention of the referent is made by a noun phrase functioning as surface subject (a subject referent). In this section, we want to argue that the difference between pronouns and repeated nouns for those cases in which the first mention of the referent is made by a noun phrase functioning as surface object (object referents) is likely to be different from that between pronouns and repeated nouns for subject referents. The section consists of five subsections. In 2.4.1, we will discuss the difference between the psychological properties of subject and object referents and relate this to the difference between pronouns and nouns for subject referents as opposed to that between pronouns and nouns for object referents.

In 2.4.2, we discuss the results of an experiment which seems to support the argument we advocate. In 2.4.3, the difference between pronouns and nouns for subject referents as opposed to that between pronouns and nouns for object referents is considered from a thematic point of view. In 2.4.4, we discuss some of the variables which are often confounded with the subject variable (eg image-value, agenthood) and in 2.4.5, we summarize the whole section.

2.4.1 Psychological considerations

Chafe (1976) suggested that knowledge about an individual referred to by a subject noun phrase may be more readily accessible than knowledge about an individual referred to by an object noun phrase. The examples given by Chafe to illustrate this point are given below as 26 and 27:

26. John broke his arm yesterday.

27. John got knocked over by a bicycle yesterday.

As Chafe argues, in both examples the speaker is taking the individual referred to by John as a starting point and providing the listener with new knowledge about that individual. 'John' is what is being talked about in both cases. It follows that the primary result of the listener's hearing these sentences is that he knows something more about 'John'. It is true that the listener also knows something about John's arm and about a particular bicycle, but it may be that such additional knowledge is secondarily derived from what these sentences communicated in the first instance. As Chafe puts it:

> These sentences package the information in such a way that it is communicated as knowledge about John. Once the package is unwrapped other things may be found inside, but knowledge directly attached to the subject may be the most immediately accessible.

> We might call this the "adding-knowledge-about" hypothesis regarding the functioning of subjects. It would seem to have some testable consequences. For example, if knowledge derived from hearing a sentence is checked soon afterward, we might expect that questions about the subject would be answered more quickly than those about other particulars in the sentence. Knowledge about the subject is what was gained from the sentence; knowledge about the other particulars must somehow be computed. (p.44)

Chafe went on to mention an experiment which seems to be relevant to his argument concerning the function of subjects. Perfetti and Goldman (1974) constructed pairs of paragraphs, in one of which a certain referent was mentioned frequently and another referent infrequently, and in the other of which the frequency was reversed. For example, in one pair of paragraphs about a pseudo-historical event in Poland in the 17th century, one of the paragraphs gave frequent mention to the serfs and infrequent mention to a certain Baron Wozjik. The other paragraph mentioned the baron frequently and the serfs infrequently. The final sentence in each paragraph was The serfs rebelled against the baron. Subsequently either the serfs or the baron were tested for their effectiveness as prompts for the retrieval of this final sentence. As might be expected, when the preceding paragraph was mainly about the serfs, the serfs were a more effective retrieval prompt than the baron. But of interest here are the results when the preceding paragraph was mainly about the baron. In that case the effectiveness of the serfs and the baron as retrieval prompts was equal. The serfs, of course, was the subject of the target sentence, and these results suggest that its subject provides a particulary effective prompt for a sentence, even when the preceding context has been predominantly about something else. The fact that the target sentence was about the serfs was all that was needed.

Other evidence which seems to give general support to Chafe's argument was reported by various scholars. Anderson (1963), Coleman (1965), Prentice (1966), and Turner and Rommetveit (1968) found that for active and passive sentences which differ in the thematic emphasis, but not in 'cognitive' meaning, the surface subject was better recalled than the surface object.

If, as we have argued before, the use of the pronoun requires that the referent be readily accessible, and if surface object referents are likely to be relatively less accessible than surface subject referents, then there may be some justification for repeating the noun to refer back to object referents. To illustrate this point, consider 28 and 29 below:

28. The ball hit Tony.

a. He/b. Tony was extremely angry.

29. John scored the goal.

a. He/b. John was absolutely delighted.

On the basis of Clark and Sengul's 'discontinuity model', both "John" and "Tony" are likely to be foregrounded. However, and on the basis of Chafe's argument, "Tony" is likely to be relatively less foregrounded than "John".

If this is so, then the noun may be be repeated to refer back to "Tony". The repetition of Tony, unlike that of John, may be regarded by the listener as a reinstatement of a referent to which he has not paid great attention.

If we gradually add intervening sentences in which the referent is not mentioned to 28 and 29, then there would come a point in the discourse at which both 'John' and 'Tony' would no longer be foregrounded. At that point, the repeated noun will be more effective than the pronoun in both cases. If, however, John is likely to be granted a privileged status in memory because of its special status, then we would expect the referent of Tony to be no longer foregrounded at an earlier point in the discourse than the referent of John. Consequently, the point at which the repeated noun will be more effective than the pronoun would come earlier in the discourse when the antecedent is surface object (e.g. Tony) than then it is surface subject (e.g. John). Thus, for example, after three intervening sentences in which the referent is not mentioned, the pronoun might still be as effective as the noun for subject referents whereas the noun might be more effective than the pronoun for object referents. Consider 30 and 31 below (Sanford and Garrod, 1978):

30. The engineer repaired the television set.
It had been out of order for 2 weeks.
It was only a few months old.
It was the latest model.
a. He/b. The engineer took only five minutes to repair it.

31. The mother picked up the baby.
She had been ironing all afternoon.
She would not be finished for some time.
She was very tired.
a. It /b. The baby had been crying nearly all day.

Because of its special status, "the engineer" may still be foregrounded by the time it is referred to for the second time. The referent "the baby", on the other hand, may no longer be foregrounded by the time the second mention of the referent is made. Hence, the repetition

of the baby may be more effective than it in identifying "the baby" whereas He may be as effective as the repetition of the engineer in identifying "the engineer".

2.4.2 Sanford and Garrod (1978):

Sanford and Garrod conducted an experiment the results of which seem to support the view that the difference between pronouns and repeated nouns is affected by the status of the antecedent. 30 and 31 above are examples of the materials used in this experiment. Another version of each set of materials was produced in which the second and the third intervening sentences were absent - otherwise they were identical. The results of this experiment are summarized as follows:-

1. Regardless of whether the reference is made by the pronoun or the noun and regardless of whether the antecedent is subject or object, the referent was interpreted faster when its second mention was made after one intervening sentence than when it was made after three intervening sentences.

2. References to antecedents in the object position are slower than references to antecedents in the subject position. On this finding, Sanford and Garrod wrote:

> This fits the view that the subject and the object do indeed differ in terms of their availability foraddress in working memory. (p.7)

3. A. For the subject position antecedent, targets containing a pronoun are read slightly more quickly than targets containing a repeated noun, this effect persisting even in the three intervening sentence condition. On this finding, Sanford and Garrod wrote:

> Pronominal reference is apparently successful, and we suggest that a representation of the individual referred to by the subject of the first sentence is still topicalised and resides in working memory. This of course fits into the view that we usually begin a paragraph by establishing what we are going to talk about, and consequently expect reference to that topic to be made. (p.7-8)

B. In the case of the object position results, the pattern is very different. Although after one intervening sentence a pronoun target sentence can still make a reference faster than a noun-phrase, after three intervening sentences the opposite is true. Thus for the object position materials the individual is no longer in working memory, and cannot be addressed without considerable difficulty.

To explain the difference between pronouns and repeated nouns when the antecedent is subject as compared with that between pronouns and repeated nouns when the antecednet is object, Sanford and Garrod suggested that:

> When the first sentence is read, it establishes some sort of basic scenario, with the centre of the representation being the activity of the subject, other individuals being more peripherally represented. Continued reference to entities other than the topic has the effect of maintaining them in working memory, but the topic representation is maintained in working memory too, at least for some time, because of its special status. (p.8)

Thus, after three intervening sentences the representation of the subject is still maintained in working memory (ie foregrounded) whereas that of the object is no longer maintained in working memory (ie no longer foregrounded). This explains why pronouns were more efficient than repeated nouns when the antecedent is subject whereas repeated nouns were more efficient than pronouns when the antecedent is object.

In order to explain the effect of intervening sentences, Sanford and Garrod proposed that:

> The amount of workspace devoted to a representation is inversely dependent on the amount of intervening computation which has been done that does not involve that representation. (p.8)

To explain the difference between the subject and the object referencing, Sanford and Garrod suggested that:

> References to the subject are faster because more workspace has been allocated to its representation. Possibly the duration over which a representation remains in working memory depends upon the initial workspace allocation. (p.9)

2.4.3. Thematic considerations

So far we have concerned ourselves with explaining the difference between pronouns and repeated nouns when the antecedent is subject as compared with the difference between pronouns and repeated nouns when the antecedent is object in terms of the difference between the psychological properties of the subject and the object representations. A different sort of argument (an argument which is based on how information is packaged in discourse) for why an object referent, unlike a subject referent, may be referred back to by the repetition of the antecedent noun phrase was presented by Bolinger (1977, 1979). According to Bolinger, the speaker repeats the noun in order to reintroduce a non-topic referent as topic. On this issue he wrote:

> Lakoff rightly observed that it is more unusual (he felt it was impossible, but that has been shown to be false) to have the combination he ... John than him .... John. The reason for this I think lies in the possible motives for reidentifying the referent by means of a noun. One such motive ---- the one relevant here --- is to reintroduce the referent as topic. In the combination he .... John the referent is probably already topic, and there is less reason for using John. In the combination him .. John, the referent is probably not topic, and there is more reason for using John. (p.32, 1977)

To relate Bolinger's point to our discussion, consider the following examples:

32. The engineer repaired the refrigerator.

It/The refrigerator had been out of order for 2 weeks.

33. The mother picked up the baby.

She/ The mother had been washing nearly all afternoon.

In the first sentence in 32, the referent "the refrigerator" is introduced by a noun phrase functioning as surface object. In the second sentence, however, "the refrigerator" is reintroduced as surface subject. The second sentence, unlike the first, is about "the refrigerator". For this reason, the noun may be repeated rather than pronominalized. The repetition of the noun in 32 conveys something new to the listener though not at the 'cognitive' level but at the 'thematic' level (ie what has been presented as an object referent is now being presented as a subject referent).

In 33, on the other hand, the referent has already been introduced as surface object. Hence, there is no reason to repeat the noun. The repetition of the mother produces a marked version of message organization. On the other hand, the repetition of the refrigerator is thematically meaningful.

2.4.4. Confounding the 'subject' variable with other variables

One variable which is often confounded with the "subject" variable (a sentential notion) is the "agent" variable (the semantic notion). To illustrate this point, consider the argument that the representation of the subject is allocated a bigger workspace in memory than that of the object because of its special "subjecthood" status. It may be that the representation of the subject is allocated a bigger workspace in memory not because of its "subjecthood" status only but because of the combination of its "subjecthood" status and its semantic role as "agent" or simply because of its semantic status only.

Thus, unless the "agent" factor is separated from the "subjecthood" factor (eg.by using passive sentences), one cannot make any claims about the "subjecthood" factor alone.

Another variable which is often confounded with the "subject" variable is the 'image-value' variable. James (1972) questioned the validity of various experiments which showed that surface-structure subjects were recalled with greater frequency than surface-structure objects (eg Anderson, 1963; Clark,1966; Coleman, 1965; Horowitz & Prytulak, 1969; Clark and Card, 1969). According to James,none of these experiments have included adequate controls to minimize inherent recall differences between subject and object nouns. As James puts it:

> The possibility of a confounding is very real, due to the nature of transitive verbs. On the evidence of Hall (1965), it appears that transitive verbs are more likely to take an animate subject than an animate object. Animate nouns are of course concrete, whereas inanimate nouns may be abstract. Paivio (1969) has amply demonstrated the superiority of concrete nouns over abstract nouns in a variety of memory tasks.
>
> It is possible that the subjects of any randomly selected set of transitive sentences would be more concrete (and hence more recallable) than the objects of these sentences. In fact, the sentences used in some studies (cf Anderson, 1963; Clark, 1966) have been produced by students filling in the blanks of stimulus frames (eg The ----ed the ----). Clark (1965) reported that, using this procedure, 82% of the sentences contained animate subjects, and only 27% contained animate objects. Syntactic function aside, the subjects of these sentences would be expected to be recalled more often than the objects. If greater psychological importance is attached to sentence's grammatical subject, then subject recall should be superior to object recall when inherent differences among nouns (eg frequency, image-value, length) are equated. (p. 205-206)

James performed two experiments in which active and passive sentences were used. In these experiments, unlike other previous similar experiments, the image-value of subjects and objects was varied to allow an assessment of the role of syntactic function on sentence memory, unconfounded by differences in recallability among nouns.

The results of these experiments showed that the grammatical subject was not recalled better than the grammatical object for either active or passive sentences when the confounding was eliminated.

2.4.5 Summary of the section

1. In this section, we have concentrated on the difference between the psychological properties of the surface subject and the surface object, and how this difference is closely related to the difference between pronouns and repeated nouns for subject referents as compared with that between pronouns and repeated nouns for object referents. The results of Sanford and Garrod's experiment showed that after three intervening sentences in which the referent is not mentioned, the pronoun is more effective than the repeated noun when the antecedent is surface subject whereas the opposite is true when the antecedent is surface object. These results were explained in terms of the difference between the accessibility of surface subject and surface object referents. Because of its special status, the referent of the subject, unlike that of the object, could still be foregrounded after three intervening sentences.

2. Bolinger argues that the noun may be repeated (rather than pronominalized) in order to reintroduce a non-topic referent as topic. On the basis of this argument, we suggested that the noun may be repeated in order to reintroduce an object referent as surface object. On the other hand, if the referent has already been introduced as surface subject, then there is no reason to repeat the noun.

3. The "subject" variable is often confounded with the "agent" and the "image-value" variables. Unless the investigator separates the "agent" factor from the "subjecthood" factor and unless he controls the "image-value" factor, he cannot claim that the subject referent is more accessible than the object referent because of the former's special "subject-hood" status only.

CHAPTER THREE

THEORETICAL MODEL

3.0 AIMS AND STRUCTURE:

This chapter consists of two main sections. In 3.1, referents are classified in three different ways. Each of these classifications corresponds to each of the factors mentioned in the preceding two chapters. In 3.2, we state (in general terms) the predictions tested by the experiments. These predictions are based on the argument introduced in 1.1 of the first chapter and expanded in chapter two.

3.1 TYPES OF REFERENTS:

3.1.1. Classification A: Distance factor

On the basis of this factor, there are two possible ways of classifying referents:

(i) In terms of intervening other referents between the two mentions of the referent (Bolinger, 1977/1979; Clark and Sengul's "Continuity model", 1979; Yule, 1980). Thus, for example, Yule distinguishes between:

A. Current referents: no intervening other referents between the two mentions of the referent as in 1 below:

1. John hit Mary. She got very angry.

B. Displaced referents: intervening referents between the two mentions of the referent as in 2 below:

2. John hit Mary. He was drunk.

(ii) In terms of intervening sentences containing other referents (Chafe, 1972; Clark and Sengul's "discontinuity model", 1979; Lesgold et al, 1979).

In this study, we have adopted the second of these approaches. A distinction is made between Current [C] and Displaced [D] referents. These two terms were borrowed from Yule (1980). However, our definition of these terms is different from that of Yule. By [C] referents we mean those referents whose two mentions in the discourse are not separated by intervening sentences containing other referents as in 3 and 4 below:

3. The Rolls Royce struck the woman.

It/The Rolls Royce was travelling at a very high speed.

4. The boy scratched the Mercedes.

It/The Mercedes was standing by the kerb.

By [D] referents we mean those referents whose two mentions in the discourse are separated by intervening sentences containing other referents as in 5 and 6 below:

5. The Rolls Royce struck the woman.

She fell down unconscious.

She could hardly breathe.

She died shortly afterwards.

It/The Rolls Royce was travelling at a very high speed.

6. The boy scratched the Mercedes.

He ran away.

He didn't dare look back.

He was afraid of being caught.

It/The Mercedes was standing by the kerb.

Displaced referents are classified into:

(i) Displaced 1 [D1] referents: the two mentions of the referent are separated by one intervening sentence containing other referents as in 7 and 8 below:

7. The Rolls Royce struck the woman.

She fell down unconscious.

It/The Rolls Royce was travelling at a very high speed.

8. The boy scratched the Mercedes.

He ran away.

It/The Mercedes was standing by the kerb.

(ii) Displaced 3 [D3] referents: the two mentions of the referent are separated by three intervening sentences containing other referents as in 5 and 6 above.

3.1.2. Classification B: The status of the antecedent

On the basis of this factor, a distinction is made between Subject [S] and Object [O] referents. [S] referents are those which are introduced in the discourse by a noun phrase functioning as surface subject as in 3,5 and 7 above. [O] referents are those which are introduced in the discourse by a noun phrase functioning as surface object as in 4,6 and 8 above.

By combining classification A with classification B we have:

1. Current subject [CS] referents as in 3 above.
2. Current object [CO] referents as in 4 above.[1]
3. Displaced subject [DS] referents as in 5 and 7 above.

4. Displaced object [DO] referents as in 6 and 8 above.

5. Displaced 1 subject [D1S] referents as in 7 above.

6. Displaced 1 object [D1O] referents as in 8 above.

7. Displaced 3 subject [D3S] referents as in 5 above.

8. Displaced 3 object [D3O] referents as in 6 above.

3.1.3. Classification C: pragmatic factor.

On the basis of this factor we distinguish between:

(i) Referents which are not uniquely identified by the expression [NU] as in 9 below:

9. Catherine heard the door-bell.

She/Catherine refused to open the door.

(ii) Referents which are uniquely identified by the expression [U] as in 10 below:

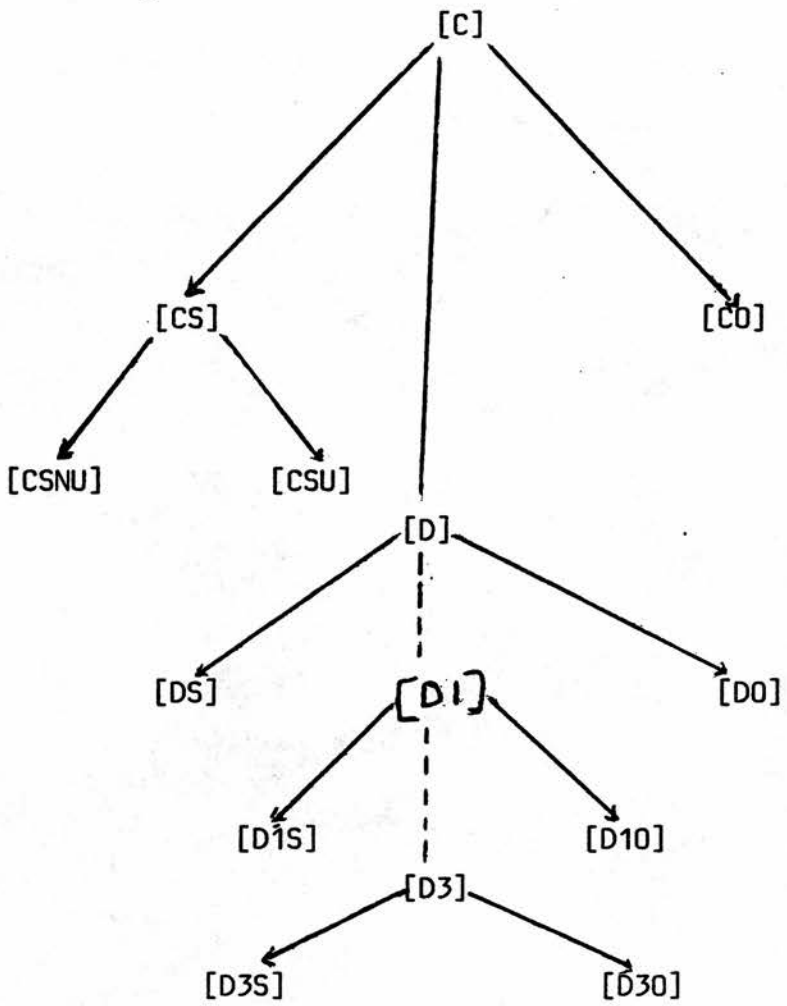
10. Shakespeare died in 1616.

He/Shakespeare left £10 for the poor of Stratford.

In this study, we will only make use of the distinction between Current subject referents which are not uniquely identified by the expression [CSNU] and Current subject referents which are uniquely identified by the expression [CSU].

Figure 3.1.1. below shows the various types of referents we have defined and the relationship between them.

Figure 3.1.1. Types of referents



3.2. THE PREDICTIONS

3.2.1. Predictions tested in Experiment 1:

The major prediction tested in this experiment is that the difference in effectiveness between pronouns and nouns is likely to depend on whether the antecedent is subject or object. It is expected that the pronoun will be more effective than the noun only when the antecedent is subject. When the antecedent is object, the noun may be as effective as the pronoun. The subject referent is what is being talked about and listeners expect reference to it to be made by the pronoun rather than by the noun. The object referent, on the other hand, is part of what is being said about the subject referent. If the object referent is reintroduced in the subject position. then there may be some justification for repeating the noun. **The repetition** of the noun in this case conveys the meaning "what has been introduced as part of what is being said about the subject referent is now being reintroduced as what the message is about".

3.2.2. Predictions tested in Experiment 2:

The theory critized in chapter 2 argues that the noun, unlike the pronoun, cannot unambiguously identify the referent for the listener. In the case of [CSu] referents, both the pronoun and the noun unambiguously identify the referent. Hence, this theory would predict that the pronoun and the noun would be equally effective when the referent is [CSu]. As we have argued before, the difference between the pronoun and the noun(regardless of whether the referent is [CSu] or [CSnu]) should be viewed as a difference between an unmarked from (ie - the pronoun) and a marked one (ie the noun) rather than a difference between an unambiguous form and an ambiguous one. The use of the pronoun for [CSu] referents is as marked as its use for [CSnu] referents. Hence, we predict that the noun will be less effective than the pronoun even in the case of [CSu] referents where both the pronoun and the noun are unambiguous.

3.2.3. Predictions tested in Experiment 3:

The first prediction tested in this experiment is that, when intervening sentences containing other referents separate the antecedent and the anaphor, the noun is likely to be more effective than the pronoun. If, as we have argued before, the use of the pronoun requires that the referent be readily accessible, and if this is not likely to be the case when intervening sentences containing other referents separate the antecedent and the anaphor, then the noun rather than the pronoun should be used.

The second major prediction tested in this experiment is that the difference between the pronoun and the noun when intervening sentences containing other referents separate the antecedent and the anaphor is also likely to be affected by whether the antecedent is subject or object. Because of their 'special' status, subject referents are likely to be allocated a bigger workspace in memory than object referents. Hence, and by the time the referent is referred to again by the anaphor, the subject referent is likely to be relatively more accessible than the object referent. As a result, the pronoun may still be effective in identifying the subject referent whereas the pronoun may not easily be able to reach the relatively inaccessible object's referent.

The third prediction is that [D1] referents are likely to be easier to interpret than [D3] referents. This prediction is based on the claim that referents are likely to become gradually less accessible as more and more intervening sentences in which the referent is not mentioned are uttered. If [D3] referents are likely to be less accessible than [D1] referents, and if, as we have argued before, the difference between pronouns and nouns reflects the difference between the cognitive accessibility of referents, then one would also expect the difference between pronouns and nouns to vary with whether the referent is [D1] or [D3].

Thus, and although the noun may be superior to the pronoun for both [D1] and [D3] referents, one would expect the superiority of the noun over the pronoun to be greater for [D3] than for [D1] referents.

NOTES

1. When Current Object [CO] is mentioned passin, note that it would be better labelled as [CO - subject] as soon as it appears in the subject position.

CHAPTER FOUR

RESEARCH TECHNIQUE

4.0 AIMS AND STRUCTURE

The experiments reported in chapters 5, 6 and 7 were designed to test the predictions outlined in chapter 3. The experimental technique adopted was to measure the time it takes subjects to understand experimentally-controlled spoken sentences on the assumption that this time reflects the underlying mental processes involved in the interpretation of the sentences. This measure will be referred to as the listening-time measure. Another measure which has been widely used recently is the reading-time measure. The listening-time and the reading-time measures have much in common but the two measures are not exactly the same. In this chapter we will be concerned with describing and evaluating the listening-time and the reading-time measures. Another aim of the chapter is to discuss three statistical approaches for communicating results of language experiments. The chapter consists of two major sections. The first issue will be dealt with in 4.1 and the second issue will be dealt with in 4.2. Each of these sections consists of a number of sub-sections.

4.1 EXPERIMENTAL TECHNIQUE

4.1.1. Reading-time methodology

4.1.1.1. Description of the Methodology

The reading-time measure has been widely used in the study of inference processes (Haviland & Clark, 1974; Hastie & Anderson, 1974; Garrod & Sanford, 1977; Yekovich & Walker, 1978; Haberlandt & Bingham, 1978; Clark & Sengul, 1979; Singer, 1979; Lesgold et al, 1979; Yekovich et al, 1979; Sanford & Garrod, 1978;).

In a typical experiment, subjects are presented with a text, one sentence at a time. Subjects initiate the presentation of each sentence by pressing a key. Reading time for a sentence is defined as the time between the key press to initiate that sentence, and the key press to initiate the next sentence. It is assumed, first, that the reading time for a sentence is the time to comprehend the sentence, and, second, that longer reading times represent greater amounts of processing required for comprehension. Thus, reading time is assumed to give an "on - line" indication of inference processes; when an inference is required, reading time increases. For example, consider the following two pairs of sentences (Haviland & Clark, 1974):

1. John left the beer in the car.
The beer was too warm to drink.
2. John left the picnic supplies in the car.
The beer was too warm to drink.

Reading time for the second sentence of 2 is found to be longer than reading time for the second sentence in 1 and this is assumed to be because an inference (ie "bridging") is required.

4.1.1.2 Mckoon and Ratcliff's comments on the reading-time methodology

Mckoon and Ratcliff (1980: 670 - 671) argue that there are several problems with the reading-time methodology. These problems fall into two classes:

1. It is difficult (although not impossible) to design experiments that answer theoretical questions unambiguously, that is, experiments where the observed data cannot be attributed to some uninteresting confounding variable.

2. Even if an experiment is designed in which there are no confounding variables, there are severe limitations on the kinds of theoretical questions that can be addressed. These two problems will be taken up in order.

1. Confounding variables:

According to Mckoon and Ratcliff, reading time differences that have been obtained in published studies and attributed to inference processes can instead be attributed to several kinds of confounding variables:

A. Certain critical words in the target sentence may be repetitions of words in earlier sentences in one condition (where no inference is supposed to be required) but not in another condition (where an inference is supposed to be required). Thus the differences in reading time of the target sentence may be the result of uninteresting repetition effects rather than inference processes. (p.670)

B. Increases in reading time in conditions that are supposed to involve inference processing may be due, not to inference processing, but instead to subjects' recognitions that such processing is required. That is, increases in reading time may be due to the time it takes the subject to decide that inference processing is required plus the time it takes to decide not to perform this processing (there are an awful lot of these paragraphs to read and the pay isn't great). In other words, increases in reading times may simply reflect judgements of comprehensibility (or incomprehensibility). (p.670)

C. The usual way of performing reading time studies is to hold a target sentence constant and vary the preceding context across conditions. Clearly, comprehension time for the target independent of the context sentences cannot vary with conditions because the words of the target are exactly the same across conditions. But it cannot be assumed that reading time of the context sentences independent of the target does not vary across conditions. If reading time of the context sentences does vary across conditions, then reading time for the target may be increased not because the target requires inference processing, but because of the context sentences. The subject may still be processing the context sentences while, or instead of, the target or there may be general sequential effects, with a slow reading time of the context sentences producing a subsequent slow reading time of the target. (p.670)

2. Limitations of the reading-time technique:

On this issue Mckoon Ratcliff write:

> Reading time can indicate when increased processing is required, but it cannot indicate what that processing is. With respect to inference, reading time may be longer because the subject searches for a to-be-inferred concept but does not find it. Or the concept may be found and activated but not connected to the new propositions as it should be. Even if the proper connections are made, they may not be stored in the long term memory representation of the text. In general, reading time cannot be used to investigate the component processes of inference. (p,671)

4.1.1.3 Reply to Mckoon and Ratcliff's comments:

Our reply to Mckoon and Ratcliff's comments on the confounding variables consists of three major points:

1. Scholars who used the reading-time technique are perfectly aware of these confounding variables and these scholars have managed to eliminate them without having to change the reading-time technique. Let us take these variables in turn and give some examples of the studies in which they were eliminated.

A. Repetition:

Having demonstrated that the subjects took longer to understand the target sentence in Indirect Antecedent pairs (as in 2 above) than those in the Direct Antecedent pairs (as in 1 above), Haviland and Clark (1974) went on to add:

> Although the results of Experiment I confirmed to our predictions, there is one obvious alternative explanation of these results. All of the Direct Antecedent pairs contained the repetition of the noun, while none of the Indirect Antecedent pairs did. Our results might therefore have arisen because of the simple facilitating effect of repetition (Smith, Chase, & Smith, 1973). To test for this possibility we performed Experiment II, in which both Direct and Indirect Antecedent pairs involved repetition. (p.515)

The results of this second experiment performed by Haviland and Clark were the same as those of the first experiment.

B. As for Mckoon and Ratcliff's claim that "increases in reading time may be due to the time it takes the subject to decide that inference processing is required plus the time it takes to decide not to perform this processing" we reply that:

a. Had the subjects used in the studies of inference processing decided not to perform the processing, then there would probably have been no difference between the reading time for sentences which required inference processing and the reading time for sentences which did not require inference processing. This is because the subjects would have had pressed the key as quickly as they could regardless of whether the sentences they were supposed to be processing required or did not require inference processing. The subjects' main aim would have been to finish the task as quickly as they could.

b. Even if we assume that the subjects would decide not to perform the processing because 'there are an awful lot of these paragraphs to read and the pay isn't great', the reading-time methodology is potentially capable of detecting whether the subjects are performing the processing or not. For example, a question could be added to each paragraph in order to make sure that the subjects are performing the processing (as it is in the experiments described in this thesis/see 3 below).

C. As for Mckoon and Ratcliff's argument that "reading time for the target may be increased not because the target requires inference processing, but because of the context sentences", we reply that:

a. This argument does not apply to studies where the context sentences are held constant across conditions and where what is varied is the target sentence.

An example of such studies is that performed by Sanford and Garrod (1978).

b. Even in those studies in which the target sentence is held constant while the preceding context is varied across conditions, it is not difficult to find out whether or not the reading time of the context sentences affects the reading time of the target sentences. If it is found that the reading time of the context sentences affects the reading time of the target sentences, then another experiment could be performed in which this confounding variable is eliminated.

2. The second major point we want to make in reply to Mckoon and Ratcliff's comments on the confounding variables is that a confounding variable which can be located may turn out to be interesting provided that this variable has to do with some characteristic of language (e.g. difficulties in processing some sentences may lead to difficulties in processing other sentences) and provided that this variable can be eliminated in a subsequent study. For example, if an investigator is interested in finding out whether target sentences in which an anaphor has an indirect antecedent take longer to understand than target sentences in which the anaphor has a direct antecedent, and if, after performing the study, he finds that some context sentences took longer to read than other context sentences and that this affects the reading time of the target sentences, then he could try to find out why some of the context sentences took longer to read than other context sentences. Perhaps, some of the context sentences are negative while others are positive, some are long while others are short and so on. As for the variables of most interest to the investigator, another experiment could be performed in which the confounding variable is eliminated.

3. The third major point we want to make is that the confounding variables mentioned by Mckoon and Ratcliff do not exist in the experiments performed in this study.

First, repetition, which is described by Mckoon and Ratcliff as being an example of a 'fairly trivial' variable, is one of the major variables investigated in this study. As has been mentioned in the first chapter, the aim of this study is to find out the circumstances in which the listener would prefer one anaphoric form rather than another (ie pronoun or repeated noun) to be used to refer back to a previously introduced referent.

Secondly, Mckoon and Ratcliff's argument that 'increases in reading time may be due to the time it takes the subject to decide that the inference processing is required plus the time it takes to decide not to perform this processing' is meant to apply to studies in which some of the sentences require inference processing (anaphor has indirect antecedent: picnic supplies ----- the beer) while others do not require inference processing (anaphor has a direct antecedent: the beer ---- the beer). In this study, both anaphoric forms have a direct antecedent (e.g. The engineer ---- He / The engineer). Thus, there is no question of increases in listening time in one condition being due to 'the time it takes the subject to decide not to perform this processing'.

Moreover, each paragraph in this study is followed by a question for the purpose of checking whether the subjects are performing the processing or not. Examination of the subjects' responses to the questions showed that the subjects were neither unwilling nor unable to perform the processing.

Thirdly, in most cases in this study the context sentences are held constant while the target sentence is varied across conditions. Thus, and in such cases, there is no question of the listening time of the target sentences being affected by the listening time of the context sentences since the words of the context sentences are exactly the same across conditions. In those few cases in which the context sentences across conditions do not contain the same words, we had no difficulty in finding out whether or not the listening time of the context sentences had an effect on the listening time of the target sentences.

As for Mckoon and Ratcliff's argument that 'reading time can indicate when increased processing is required, but it cannot indicate what that processing is' we reply that:

a. It is doubtful whether there is any experimental technique which can tell us the exact processes performed by the subjects to understand the sentences in an experiment. In other words, an experimental technique can tell us, for example, that the subjects found sentences of type X easier to understand than sentences of type Y but it cannot tell us what are the exact processes performed by the subjects to understand the sentences of the two types. All that the investigator can say is that the subjects performed certain processes to understand sentences of type X and other (or additional) processes to understand sentences of type Y.

b. The reading-time and the listening-time techniques could be used to test different claims concerning the mental processes performed to understand sentences of type X as opposed to those performed to understand sentences of type Y.

For example, the results of Experiment 1 in this study showed that the subjects took longer to understand sentences like 3b than sentences like 3a below:

3. Tom jumped the fence. a. He/b. Tom fell to the ground.

The theory criticised in Chapter 2 would explain these results by arguing that the second Tom, unlike he, is ambiguous between referring to the intended "Tom" and referring to another "Tom". To test this claim, Experiment 2 was performed. An example of the material used in this experiment is given below:

4. The Queen Mother celebrated her 80th birthday in August.

a. She / b. The Queen Mother received hundreds of cards from well-wishers.

The first The Queen Mother in 4, unlike the first Tom in 3, refers to a known person. If the above claim is to be supported, then there should be no difference between the listening time of 4a and 4b. This is because the listener would have no doubt that the referent of the second The Queen Mother is the same as that of the first The Queen Mother. The results of this second experiment showed that the subjects took longer to understand sentences like 4b than sentences like 4a. These results suggest that the processes involved in understanding pronoun and repeated noun sentences (when no intervening sentences separate the two mentions of the referent) could be explained, not in terms of the 'cognitive' structure of the message (ie he refers to the intended "Tom" whereas the second Tom may or may not refer to the intended "Tom"), but in terms of how listeners expect the message to be packaged to them (ie listeners expect reference to the surface subject in cases like 3 and 4 to be made by the pronoun and not by the repetition of the noun).

In summary, the reading-time or the listening-time technique could be used to find out whether a certain claim concerning the mental processes performed by subjects in understanding particular sentences could find evidential support or not.

4.1.2. LISTENING-TIME TECHNIQUE

In the previous section we concentrated on the reading-time methodology. The methodology was described and some of the problems associated with it were discussed. In this section we turn our attention to the specific approach adopted in this study ie the listening-time methodology.

4.1.2.1. Description of the listening-time methodology:

The experiments performed in this study differ from all other previous experiments which depend on the measurement of comprehension time in that the materials were aurally presented to the subjects. For this reason, the measure adopted is referred to as the listening time - measure rather than the reading - time measure. The listening-time measure and the reading-time measures have much in common. In both techniques, subjects are presented with a short, constructed text consisting of one sentence at a time. Subjects initiate the presentation of each sentence by pressing a button. Listening or reading time for a sentence is assumed to indicate the time to comprehend that sentence. Moreover, longer listening or reading times are assumed to represent greater amounts of processing required for comprehension.

The listening and the reading-time measures, however, differ in one important aspect. Whereas reading time is measured from 'a button press to initiate a sentence to another button press to initiate the next sentence', listening time is measured from 'the end of the current sentence to the button press to initiate the next sentence'. Below we will discuss two issues.

First, we will discuss one problem which is associated with the reading-time measure. Secondly, we will explain why listening time could not be measured in the same way as reading time.

4.1.2.2. Length and reading time:

If an investigator is to measure reading time from 'a button press to initiate a sentence to another button press to initiate the next sentence', then one condition must be satisfied. This condition is that the target sentences should be identical or have the same length in words. If this condition is not satisfied, then differences in reading times may be due to the difference in length between the target sentences. To illustrate, consider the following sentences (Sanford and Garrod, 1978):

5. The engineer repaired the television set.
It was brand new.

a. He / b. The engineer took only five minutes to repair it.

Reading time for sentence 'b' in 5 is found to be longer than reading time for sentence 'a' because in the former the noun is repeated whereas in the latter it is pronominalized. It might be argued that, regardless of the fact that in 5a the pronoun is used whereas in 5b the noun is repeated, sentence 5b will take longer to read than sentence 5a because the former is longer than the latter. If this is the case, then it would not be possible to know for sure whether sentence 5a was understood faster than sentence 5b because in 5a a pronoun is used whereas in 5b a noun is used or because, in addition to that, 5a is shorter than 5b, or simply because 5a is shorter than 5b. In other words, it would not be possible to know for sure whether the difference in the reading time of the two sentences is due solely to the variable of interest to the experiment (pronoun v noun), or to the variable of interest plus the

difference in length between the two sentences, or simply to the difference in length between the two sentences.

4.1.2.3. Why listening time could not be measured in the same way as reading time?

As has been mentioned before, listening time could not be measured from a button press to the next button press but rather from the end of the current sentence to the next button press. There are two reasons why listening time should be measured in this way:

1. Even if the target sentences have the same length in words or even if they are identical, it is highly unlikely that they would have the same length in time when they are spoken. If we measure listening time from 'a button press to initiate a sentence to another button press to initiate the next sentence', then differences between the listening times of target sentences would obviously be due to the difference between the length of sentences in time rather than to the difference between the experimental treatments. If, on the other hand, we measure listening time from 'the end of the sentence to the button press to initiate the next sentence', then this confounding variable (ie difference between the length of sentences in time) would be eliminated.

2. Even if we subtract any difference in time between the target sentences and regard them as if they have the same length, it would still be difficult to measure listening time from a button press to the next button press for the obvious reason that the length of spoken sentences in time is a variable which is not controlled by the subject but by the informant who records the materials for the experiments. If the length of spoken sentences in time is a variable which is not under the control of the subject, then we could not consider this time to be part of the time which he takes to comprehend the sentence.

The time of interest to us is the time which the subject takes to comprehend the sentence and not this time plus the time which the informant takes to say the sentence (but cf. 4.1.2.4 below).

To sum up, because the target sentences in this study do not have the same length in time and because the length of sentences in time is a variable which is not under the control of the subject, we have chosen to measure listening time for each sentence from 'the end of the current sentence to the button press to initiate the next sentence' rather than from 'a button press to initiate a sentence to another button press to initiate the next sentence'.

4.1.2.4. Problems with the listening time measure:

There are three problems with the listening-time measure. These are discussed below:

1. Listening time as measured in this study may not represent the whole of the actual time spent by the subject to process the sentence. This is because a subject may well start processing the sentence before it is finished. It is also possible for a subject to finish processing the sentence even before it is finished. The ideal approach would have been to measure listening time from when the subject starts thinking about the sentence even while it is being said up to the time when he feels he has understood the sentence even before it is finished. One problem with this approach is that it may be quite difficult, if not impossible, for a subject to tell us when he starts thinking about the sentence. Moreover, and even if we assume that a subject can tell us when he starts thinking about the sentence, it would still be difficult to adopt this approach because we do not have the technology required for it.

2. Measuring listening time from 'the end of the current sentence to the next button press' would not solve the problem of the difference in length between the target sentences. Thus, it may be argued that listening time, as measured in this study, is likely to decrease with the increase in the number of words in the sentence. Indeed, there is already evidence from the results of experiment 1 to support this view. An analysis of the listening time for the context sentences in this experiment showed that the longer the sentence in words, the shorter the time it took subjects to claim that they have understood it. Thus, it seems that the difference in length between the target sentences is not only a problem with the reading-time measure but also with the listening-time measure.

3. The third problem with the listening-time methodology is a practical one. As far as this study is concerned, a great deal of time was spent in designing the equipment, modifying it, making the data tapes, running the experiments and calculating the listening time for each sentence. As a result, fewer experiments were carried out than planned.[1]

4.1.2.5. Summary of similarities and differences between the listening and the reading time techniques:

A. Similarities:

1. Both measures assume that "interpretation time" reflects the underlying mental processes involved in the interpretation of the sentences. Longer reading or listening times were assumed to represent greater amounts of processing required for comprehension. Note that what we are interested in is the not the actual time which must always include such times as the time the subject takes to decide that he has understood the sentence, the time he takes to decide to press the button and the time he takes to press the button. What is of interest to us is the difference between the times.

2. In both measures, subjects are presented with a text, one sentence at a time. Subjects initiate the presentation of each sentence by pressing a button. Subjects are instructed to press the button to request the next sentence when they feel they have understood the current sentence. Thus, processing time is subjective; it is how long the subject takes before he 'feels he has understood the sentence'.

3. If in a reading or listening time study the target sentences do not have the same length in words, then differences in processing time may reflect not only the difference between the experimental treatments but also the difference between the length of sentences in words. In the case of the reading-time measure, it might be argued that, regardless of the difference between the experimental treatments, longer sentences will take longer to read. In the case of the listening-time measure, on the other hand, it might be argued that, regardless of the experimental treatments, listening time will <u>decrease</u> with the increase in the number of words in the sentence.

B. <u>Differences:</u>

1. Whereas reading time is measured from 'a button press to initiate a sentence to another button press to initiate the next sentence', listening time is measured from 'the end of the current sentence to the button press to initiate the next sentence'.

2. A: More pieces of equipment are required for an experiment which uses the listening-time methodology than for an experiment which uses the reading-time methodology. Most reading time experiments use two pieces of equipment, a computer and a Visual Display unit. The materials are presented on this unit and the computer measures the reading time for each sentence. The experiments performed in this study required 5 pieces of equipment.

These are:

a. A control box.

b. A two-track tape recorder.

c. A computer.

d. An eight-channel mingograph.

e. A Dichotic TapeMarking Apparatus.

The function of each of these pieces of equipment will be described in the following chapters (chapters 5, 6, and 7).

B. The experimental procedure in the listening-time methodology is more complex and requires more time in preparation and procedures than that in the reading-time methodology. First, the materials in a listening time experiment, unlike those in a reading time experiment, have to be transformed from the written medium to the spoken medium. Obviously, these sentences could not be the same as naturally spoken sentences. All that the informant could do is to read them as naturally as he can. This problem, of course does not exist in reading time experiments. Secondly, listening time experiments, unlike reading time experiments, required that a tone be recorded preceding each sentence. These tones are recorded in a separate track from that in which the sentences are recorded. Each tone stops the tape-recorder after each sentence is heard. Thirdly, listening time, unlike reading time, can only be indirectly obtained. In both the reading and the listening-time techniques, the computer (or some other clock) measures the time from a button press to the next button press. In the case of the reading time technique, this time constitutes the reading time for each sentence. In the case of the listening-time technique, on the other hand, the time from a button press to the next button press constitutes:

a. Listening time: time from the end of the sentence to the next button push.

b. Length of the sentence in time.

c. Time from the button push to request a sentence to when the sentence is actually heard.

Thus, listening time can only be obtained by subtraction:

Listening time = time from a button press to the next button press (time provided by the computer) - length of sentence in time - time from the button push to when the sentence is heard by the subject.

The experimental procedure will be described more fully in the following three chapters.

4.2. THE COMMUNICATION OF RESEARCH RESULTS

4.2.1. Language materials as random effects

Coleman (1964) criticized some of the statistical procedures psychologists were then (and some still are) using to deal with language samples in their study of verbal behaviour. As he put it:

> Many studies of verbal behaviour have little scientific point if their conclusions have to be restricted to the specific language materials that were used in the experiment. It has not been customary, however, to perform significance tests that permit generalization beyond these specific materials, and thus there is little statistical evidence that such studies could be successfully replicated if a different sample of language materials were used (p.219).

Stimulated by this argument, Clark (1973) argued that language materials (e.g. words) should often be regarded as random effects rather than as fixed effects. As he put it:

A. When should the investigator treat language as a random effect?

The answer is whenever the language stimuli used do not deplete the population from which they were drawn. Note that the answer is not, whenever the language stimuli used were chosen at random from this population. The latter requirement is, in a sense, secondary to whether or not language should be treated as a random effect (Sic, p.348).

B. So even though the investigator knows that his words were not chosen at random, he should treat words as a random effect as long as he can think of other words he could have chosen instead. The non-random sampling procedure causes difficulty only later when the investigator wants to determine exactly what population he can legitimately generalize his results to (p.349).

C. If the investigator is to treat language as a random effect, then he must draw a sample at random from the language population he wishes to generalize to (p.350).

Clark went on to argue that the statistical treatment of language as a fixed effect in such cases is a "fallacy". One of the remedies put forward by Clark for this fallacy is that investigators should use statistics which permit them to generalize their findings simultaneously to the subjects' and language materials' populations. One of these statistics proposed by Clark is the approximate statistic min F' which can be computed from the F-ratio by subjects (F1) and the F-ratio by materials (F2). According to Clark, F1 indicates what should happen if the same materials used in an experiment were given to a new sample of subjects. If F1 is significant, then we can be fairly certain that the experimental effect will replicate on this new sample of subjects. F2 indicates what should happen if the same subjects used in an experiment were given a new random sample of materials. If F2 is significant, then we can be fairly certain that the experimental effect will replicate on this new sample of materials.

If, on the other hand, F2 is not significant, then the implication is that the experimental effect should not necessarily replicate on the new sample of language materials. The statistic min F' indicates what should happen both with a new sample of subjects and with a new sample of materials. If min F' is significant, then we can be fairly certain that the experimental effect will replicate in this case. If, on the other hand, min F' is not significant, then the implication is that the experimental effect should not necessarily replicate on a new sample of subjects and materials.

In conclusion, Clark's position can be summarized as follows:

1. Investigators should not treat the subjects as the only random effect. They should also treat the language materials as a random effect.

2. If the investigator wants to generalize his findings to both the subjects' and the language materials' populations, then he must provide statistics which enable him to do so. The statistic min F' (or its equivalents) can be used to achieve this purpose.

4.2.2. Language materials as fixed effects

Wike and Church (1976), with supporting comments from Cohen (1976), Keith Smith (1976), and Keppel (1976), have raised various objections to Clark's position. Below we will discuss some of these objections.

1. Random means random

Wike and Church argued that Clark's definitions of random and fixed effects is inconsistent with the usual definitions of these terms as set forth by various scholars (e.g. Hays, 1963; Kirk, 1969; McNemar, 1969; Winer, 1971; Edwards, 1972; Keppel, 1973;). The usual definitions of these terms involve criteria based on:

A. The number of p levels from the P possible levels of a factor which are included in an experiment.

B. The method of selecting the p levels from the P possible levels for inclusion.

If p = P, then the factor is fixed (f1). If p < P, then the factor is fixed if the p levels are selected by some non ramdon, systematic scheme (f2). If p < P, then the factor is random if the p levels are selected at random (r).

Clark's definitions of these terms, on the other hand, are based only on criterion A above: If p = P, then the factor is fixed and if p < P, then the factor is random.

As Wike and Church argued, Clark is treating language materials which conform to the traditional f2 definition (criterion B) as if they were random effects. On the light of this, Wike and Church went on to raise the question: if random selection of language materials is necessary for generalization to the P possible levels, as Clark asserts (see C in 4.2.1), what generalization is possible when an f2 effect is treated as if it were random? It is of interest to observe that a similar question was raised by Coleman in a footnote in his (1964) paper. As he put it:

> This paper will not discuss a second reason for doubting that many of these conclusions can be generalized beyond the specific language materials used in the experiment: in many of these studies, the language materials were not randomly sampled from the population they are purported to represent. On the contrary, the more usual procedure is purposely to select all the materials from one end of the distribution. For instance, in comparing the effects of pronounceability and association value, more often than not, E would purposely select words that are extremely high on one dimension and extremely low on the other. Such strategy has obvious economic advantages in achieving significant differences with a small number of sampling units, but is it safe to say that the results are true for language in general? (p.219, emphasis added)"

2. Problems of random selection of language materials

Keppel argued that the views expressed by Clark concentrated primarily on the appropriateness of particular statistical analysis and not on the more fundamental question of whether or not a researcher should sample linguistic materials randomly. According to Keppel, in most cases random sampling is not the best choice of methods for constructing lists of verbal materials. As he put it:

> In essence, the problem with random sampling is the possible covariance of other characteristics of verbal materials and the resulting ambiguity that such a confounding produces. Suppose, for instance, that we were interested in the detectability of "pleasant" versus "unpleasant" words. Since it is known that pleasant and unpleasant words differ on such relevant attributes as frequency of occurrence in the language, word length, the initial letter of the word, and the predictability of letter pairs within a word, a random sample of pleasant and unpleasant words will reflect these differences in addition to pleasantness, the variable under study. Consequently, any differences in detectability observed in this experiment as a function of pleasantness may be hopelessly confounded by the presence of these other differences. If our only purpose in this experiment were to determine whether words differing in pleasantness - and any thing else - affected detectability, the design would be appropriate. But if we wanted to determine whether pleasantness per se affected detectability, the design is inappropriate (Sic, p.264).

The problems of random selection of materials were also discussed by Cohen. On this issue, he wrote:

> If one wishes to make inferences about a population of effects, random sampling is a prerequisite for statistical induction. But theory usually imposes structural demands which make simple random sampling unsuitable. One wishes to select a sample which is representative, not of a language population, but of a theoretical framework (Sic, p. 262).

Another problem of randon sampling was discussed by Wike and Church. As they put it:

> The random selection of levels might often result in levels that do not adequately represent the P possible levels or might result in p levels that are not "good bets" to produce the behavioral differences present in the populations being studied.

For example, if the P levels were too close together, then genuine main effects or interactions might fail to be detected. While randomization is valuable as a control procedure (e.g. as a way to insure pre-experimental equalization of treatment groups), as a device for selecting p levels it is not optimal in general (p.253) .

3. Statistical and non-statistical generalization

Wike and Church argued that one of the problems with Clark's position is his failure to distinguish between statistical and non-statistical generalization. According to Wike and Church, when an experimentor generalizes he utilizes not only the statistical results of his single experiment (which must always be regarded as tentative), but also the cumulative knowledge of his field and his intuition. Generality is not obtained simply by selecting the p levels randomly.

On generalizing the results of a single experiment in which the language materials were not randomly selected (ie an f2 situation), Wike and Church wrote:

> To what larger populations of levels can an investigator generalize the results of a single experiment which includes a factor of the f2 type (fixed $p < P$)? He can generalize to larger populations for which the selected levels are typical or representative. Generalization need not be limited to the sets of selected levels, but rather to the largest subsets of the populations under study of which the selected levels are representative. In an f2 situation, determining the largest subsets of levels to which to generalize results is outside the realm of statistics. Many kinds of prior information, much of which is non-quantitative, may be utilized in making such a judgement.

Clark's prescription of the use of random effects models in this situation seems to supply a stock answer to this "largest subsets" problem, but it is the wrong answer. Random effects models should be used only in r type situations; that is, in those cases in which the experimentor randomly selects levels in place of representatively selecting them. Representative selection of fixed effects will often be the preferred method in order to take a more structured approach to experimentation and for the sake of economy. When representative selection is used, generalization of the results of single experiments must be done on a basis of judgement (pp 253 - 254) .

4. How is generality achieved?

Wike and Church reject Clark's argument that generality is achieved by using appropriate statistical procedures in analyzing the results of single experiments. According to Wike and Church, generality is attained by a variety of techniques of replication. An investigator can replicate his findings with the same subjects and materials. He can replicate with new subjects or materials or both. Other investigators can replicate with different subjects and the same or different materials. Whatever the method, Wike and Church went to argue, it is replication that leads to the generality that Clark seeks.

In conclusion, Wike and Church position can be summarized as follows:

A. Investigators should continue using fixed effects models (ie they should continue to treat language materials as fixed effects).

B. Investigators should rely on their judgement and intuition in generlizing the results of single experiments in which the materials are not randomly selected.

C. Generality is achieved by replication and not by the use of one or another statistical method in analyzing the results of a single experiment.

4.2.3. A compromise: Coleman's recommendation for handling non-random language samples

Coleman (1979) argues that the 1976 dialogue of Wike et al. vs Clark left the impliaction that the field is temporarily at a standstill because it is confronted with an either - or decision between two mutually exclusive alternatives, neither of which is yet backed by incontrovertible evidence.

According to Coleman, a vain wait for a level of assurance that will probably never come is unwise and unnecessary. A simple editorial decision can immediately give the field all the benefits of both view points. Researchers should simply report three Fs:

A. F1 which treats subjects as the single generalization variable

B. F2 which treats the language units as the single generalization variable

C. Min F' (or F') which treats both subjects and language materials as simultaneous generalization variables.

Coleman goes on to mention Cornfield and Tukey's (1956) argument that there are usually several correct ways to analyze an experiment, and that the better choice is more a matter of wisdom than mathematical correctness. Cornfield and Tukey argued that "the inference from the observations to the real conclusion has two parts, only the first of which is statistical". They offered the simile of inference as a two-span bridge across a river by way of an island. The statistical span is the one stretching from the near bank to the island. Coleman extends this simile by suggesting that reporting all three Fs provides the reader with a multiple - span bridge to the final conclusion. The familiar F1, being the fixed-effect analysis recommended by Wike et al., provides a short, sturdy bridge to the first island. From there, the reader can take his pick. He can proceed directly to the far bank via a nonstatistical span (ie ignores F2 and min F'), or, by means of the other Fs, he can gradually work his way across statistical spans to islands that lie further out in the river of generalization.

In conclusion, Coleman's argument can be summarized as follows:

A. Inference from the observations to the real conclusion consists of statistical and non statistical parts.

B. In cases in which the language materials are not randomly selected, researchers should report F1, F2 and min F' or F'.

C. Since reporting three Fs provides the reader with all the benefits of both viewpoints (ie Clark vs Wike et al.), it should cause little argument.

4.2.4. The approach adopted in this study

Before showing which approach we have adopted, the following points should be noted about the materials used in the experiments reported in this study:

A. The materials used in these experiments satisfy the usual definition of fixed effects of the type f2 (see 1 in 4.2.2.).

B. It has been suggested that language samples which are not randomly selected are unrepresentative of their populations. We suggest that language samples are often unrepresentative because of the use of constructed (rather than actual) language materials. Actual language materials are multi functional in the sense that they normally differ in more than one aspect. (see the example given by Keppel to illustrate the difference between "pleasant" and "unpleasant" words). Constructed materials, on the other hand, are usually unifunctional in the sense that investigators deliberately eliminate or equate the variables in which they are not interested. The use of actual language materials is a goal which has yet to be reached. Unless this goal is reached, it seems unreasonable to claim that results which are based on constructed samples can be generalized to actual language populations.

C. Following Cohen (1976), we suggest that the language materials used in these experiments are representative, not of language populations, but of the particular theoretical framework investigated.

In other words, if the variables of interest to us are to be properly investigated, then we have to construct passages in which possible confounding variables are eliminated. Such passages are more likely to be representative of the theory investigated than of language populations.

Despite the argument in A, B, and C above (which would dictate reporting F1 only), we have chosen to adopt the approach suggested by Coleman (1979). We reported F1, F2 and min F'. As it turned out, most of the significant results obtained in this study are significant by F1 only. The fact that few results were significant by F2 and min F' would support the view that language materials should be treated as fixed effects when they are not randomly selected (Wike et al., 1976; Coleman, 1964). The reader of this thesis may, if he wishes, consider the results of this study as applicable to the specific language materials used which, we think, should be considered as representative, not of language populations, but of the theory we have set ourselves to investigate.

NOTES

1. Another problem here is that the experimental technique adopted in this study could hardly allow an error-free measurement of listening time as defined here. The approach we have adopted in the first experiment was to measure listening time from the record provided by the mingograph. The end of each sentence was marked and then a ruler was used in order to measure listening time from there to where the subject pushed the button signalling that he had understood the sentence . Because the measurement was carried out manually (rather than by the computer), some kind of error may have resulted. The same also applies to the method we have adopted in measuring listening time in Experiments 2 and 3. In these two experiments we had to rely on both the mingograph record and the times provided by the computer in order to obtain listening time for each sentence. Using this approach, we had to carry out three measurements by the ruler in order to calculate listening time for each sentence (see chapter 6). All these manual operations may have contributed to an error in the measurement of listening time. As a result, the effects obtained in this study may not be as accurate as they might have been if a more accurate method of measurement was adopted. One approach which might have solved the problem was to record a tone at the end of each sentence (in track 2) so that the computer would measure listening time from that tone to where the subject pushes the button signalling that he has understood the sentence. This approach was not adopted because it was thought that a great deal of time would be needed to record the tone at the end of each sentence. Note that despite the problem of error in measurement, some of the effects obtained in this study will be seen to be quite robust.

PART B: EXPERIMENTAL CHAPTERS AND CONCLUSION

CHAPTER FIVE

EXPERIMENT ONE

5.1 AIMS OF THE EXPERIMENT:

In Chapter three, we made a distinction between current [C] referents and displaced [D] referents. [C] referents are those whose two mentions in the discourse are not separated by intervening sentences containing other referents. [D] referents are those whose two mentions are separated by intervening sentences containing other referents. [C] referents are divided into two types:

A. Current subject [CS]: Current referents which are introduced in the discourse by a noun phrase functioning as surface subject as in 1 below:

1. The widow bought the house.

a. She/b. The widow had been saving money for ten years.

B. Current object [CO]: Current referents which are introduced in the discourse by a noun phrase functioning as surface object as in 2 below:

2. The mother picked up the baby.

a. It/b. The baby had been crying nearly all day.

The major purpose of this experiment was to test the predictions we have associated with [C] referents (see chapter 3). Within the framework of the experimental technique adopted, these predictions could be stated as follows:

A. When [CS] and [CO] are treated together, there will be no difference between the listening time of the pronoun and the listening time of the noun.

B. When the pronoun and the noun are treated together, there will be no difference between the listening time of [CS] referents and the listening time of [CO] referents.

C. It is expected that the difference between the listening time of the pronoun and the noun will depend on whether the referent is [CS] or [CO] and that the difference between the listening time of [CS] and [CO] referents will depend on whether the anaphoric form is the pronoun or the noun:

(i) For [CS] referents, the pronoun will be faster than the noun whereas for [CO] referents, there will be no difference between the listening time of the pronoun and the listening time of the noun.

(ii) When the anaphoric form is the noun, [CO] referents will be interpreted faster than [CS] referents whereas when the anaphoric form is the pronoun, there will be no difference between the listening time of [CO] referents and the listening time of [CS] referents.

D. Hypotheses A, B and C are meant to apply to native speakers of English. The non-native speakers were used in the experiment on the assumption that they would behave differently from the native speakers. One of the original aims of the thesis was to demonstrate that non-native students do not react to anaphoric uses in the same way as native speakers. However, the thesis has finally concentrated on describing what native English speakers do rather than on a contrastive study.

5.2 MATERIALS:

Twenty-four simple active sentences were constructed.

Each of these sentences has the structure NP VP NP. A pair of simple active target sentences was constructed around each of the 24 context sentences. Half of these sentence pairs make a reference back to the subject of 12 of the context sentences and the other half make a reference back to the object of the remaining context sentences. The target sentences in each pair differ only in whether a reference is made back to the individual mentioned in the context sentence by the pronominal form of the antecedent noun phrase or by the repetition of that noun phrase. The target sentences which make a reference back to the subject of half of the context sentences are matched in length as well as in syntactic and semantic difficulty to the target sentences which make a reference back to the object of the other half of the context sentences. The sequence context sentence plus target sentence is followed by a question. The purpose of the question is to check the subjects' understanding of the target sentences. Half the questions require the answer 'YES' and the other half require the answer 'NO'. In addition to the context sentence, the target sentence and the question, the sentence 'NEXT TRIAL' introduces all the experimental trials with the exception of the first and the last trial. The first trial is introduced by the sentence 'FIRST TRIAL' and the last trial is introduced by the sentence 'LAST TRIAL'. Below is an example of the materials used in the experiment:

A. Subject:

Catherine put out the light. CONTEXT

1. She/2. Catherine went to bed seven minutes later. TARGET

Did Catherine go to bed nine minutes after she put out the light?

B. Object:

The snake bit the man. CONTEXT

1. He/2. The man died three hours later. TARGET

Did the man die three days after the snake bit him?

The materials used in the experiment are given in Appendix 1, section 1.1.

From these materials the following treatments were identified:

A. S + P: reference is made to the subject by the pronoun (A.1. above)

B. S + N: reference is made to the subject by the noun (A.2. above)

C. O + P: reference is made to the object by the pronoun (B.1. above)

D. O + N: reference is made to the object by the noun (B.2. above)

5.3 MAKING THE DATA TAPE:

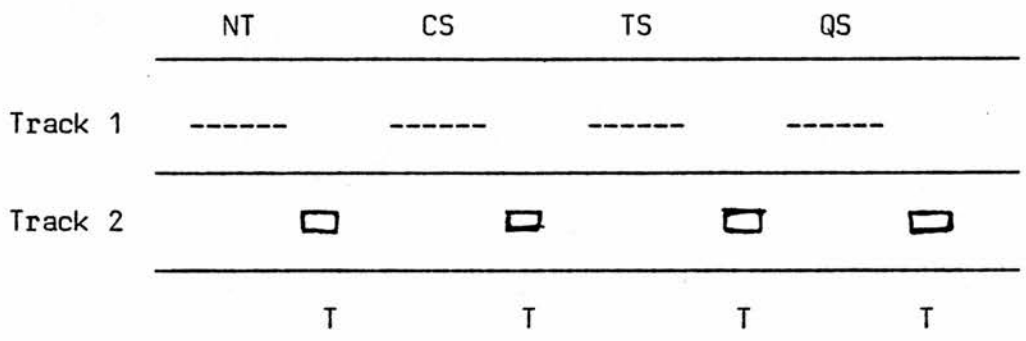
The making of the data tape required three steps:

1. The first step was to record the sentences. A native speaker of English volunteered to do this task. A two-track tape recorder was used for this purpose. The sentences were recorded in the first track. The informant was instructed to read the sentences as passages and not as isolated sentences. Half the trials were recorded in one afternoon and the other half in another afternoon. The recording of the trials was done in several stages with about six trials being recorded in each stage.

2. The second step was to copy the sentences onto another tape. Spaces were inserted between the sentences. The length of each of these spaces in time is about 2 seconds.

3. The final step was to record a tone in each of the spaces left between the sentences. A Dichotic Tape Marking Apparatus was used for this purpose. Each tone was recorded half way between the end of the current sentence and the beginning of the following sentence. These tones were recorded on the second track so that the subject will only hear the sentences (track 1). The function of each of these tones is to stop the tape recorder once the preceding sentence is heard. Figure 5.3.1 below shows the structure of a typical trial as it looks in the tape.

Figure 5.3.1: The structure of a typical trial in the tape.



The experimental tapes accompany the thesis.

5.4 SUBJECTS:

Twenty-eight students from Edinburgh University took part in the experiment. Half of these are native speakers of English and the other half are non-native speakers of English. Ten of the native speakers received £1 each for their participation and 4 agreed to take part in the experiment without payment. All the non-native speakers agreed to take part in the experiment without payment. Six of the non-native speakers speak Arabic as their first language, 2 speak Japanese as their first language, 1 Thai, 1 Punjabi, 1 Persian, 1 Shi (an African language spoken in Zaire), 1 Spanish and 1 Shona (spoken in Zimbabwe).

The advantage of using a mixed group of non-native speakers as subjects is that the results obtained from their performance could be generalized to a larger population than those obtained from the performance of a homogenous group of non-native speakers. From the applied linguistic point of view, a teaching programme based on the performance of a mixed group of non-native speakers could be applied to a larger population than a teaching programme based on the performance of a homogenous group of non-native speakers.

5.5. DESIGN:

The design used is a repeated-measure design. Each subject was presented with the trials representing each treatment. The trials were divided into two blocks, block 1 and block 2. Each block consisted of 6 S+P, 6 S+N, 6 O+P and 6 O+N. If a sentence pair contained a S+P in block 1, it would contain the S+N in block 2 and if a sentence pair contained an O+P in block 1, it would contain the O+N in block 2. The order in which the trials were presented in block 1 is random. The position of each trial in block 2 was the same as that of its counterpart in block 1. Thus, for example, if a S+P occupied position 13 in block 1, its S+N counterpart would also occupy position 13 in block 2. The order of presentation of the two blocks was counterbalanced across subjects: the first subject was presented with block 1 followed by block 2 and the second subject was presented with block 2 followed by block 1 and so on.

5.6 EQUIPMENT:

Four pieces of equipment were used in the experiment:

1. A Control Box.

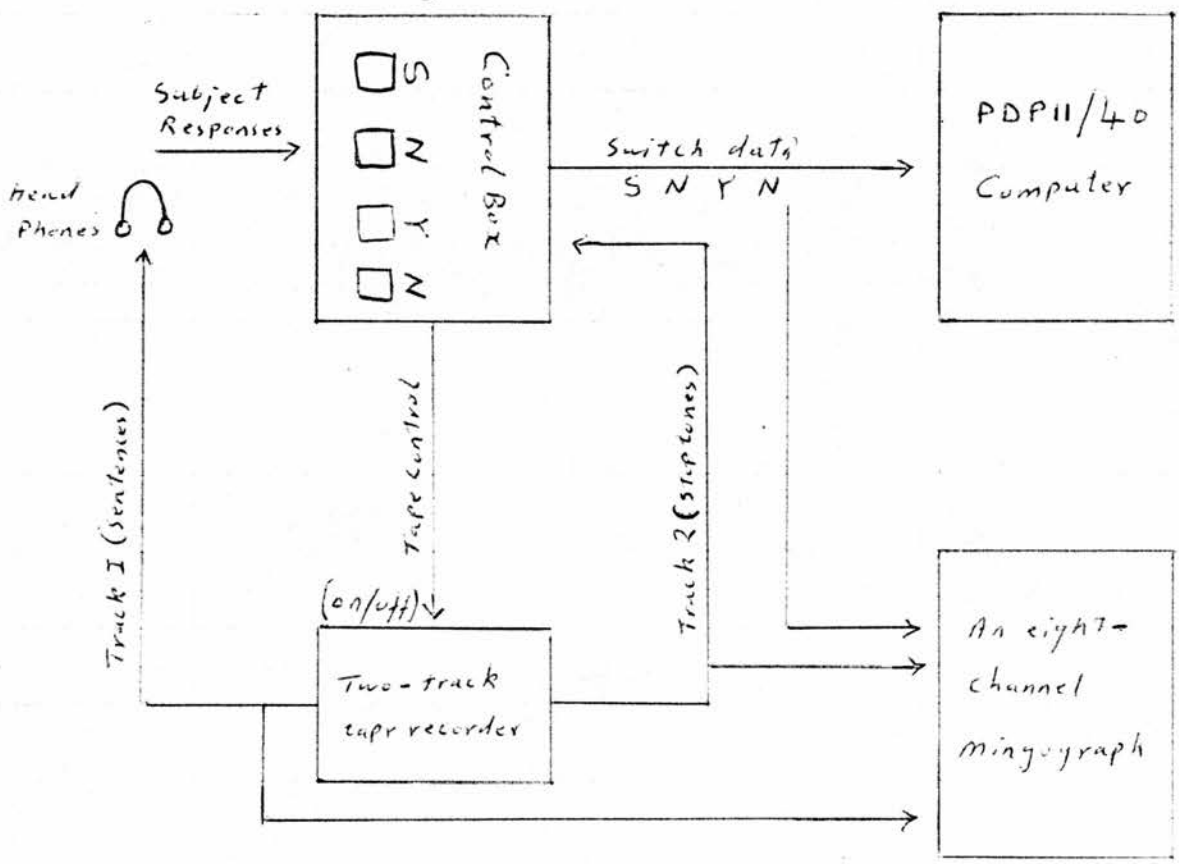
2. A Tape Recorder.

3. A DEC PDP 11 / 40 Computer.

4. An Eight-Channel Mingograph.

Figure 5.6.1 below shows the equipment and its role in the experimental procedure. The pieces of the equipment and their functions are described below.

Figure 5.6.1: Equipment and Procedure:



1. The Control Box:

Four buttons were situated on the top of the Control Box:

A. START S.

B. NEXT N.

C. YES Y.

D. NO N.

The buttons were arranged in a horizontal line with the START button being situated in a position to the left of the subject's index finger and the YES and NO buttons being situated in a position to the right of the subject's index finger. The NEXT button was situated between the START button and the YES and No buttons in a position facing the subject's index finger (see figure 5.6.1 above). The NEXT button was situated in this position because it would be used by each subject three times in each trial. The START button was situated to the left of the subject's index finger because it would only be used at the beginning of each experimental block.

The Control Box was connected to both the tape recorder and the computer. It was designed to achieve the following functions:

A. To start the tape recorder whenever the subject presses a button.

B. To stop the tape recorder (through the stop tone) after each sentence is heard.

C. To signal to the computer when to start timing for a sentence (ie when the subject presses a button requesting the sentence) and when to stop timing for that sentence and start timing for the next one (ie when the subject presses a button signalling that he has understood the sentence and is ready for the next one).

2. The Computer:

The computer measured the time in centiseconds from each button push to the next button push:

A. Time from first NEXT button push to second NEXT button push: Context sentence.

B. Time from second NEXT button push to third NEXT button push: Target sentence.

C. Time from third NEXT button push to YES or NO button push: Response to the question.

D. Time from YES or NO button push to first NEXT button push: Time for NEXT TRIAL.

Below is an example of how the computer presented the data:

Subject 17 (Block 2): trials 3 to 7

3	1	2	185
3	2	2	241
3	3	2	203
3	4	4	337
4	1	2	188
4	2	2	240
4	3	2	257
4	4	4	439
5	1	2	154
5	2	2	232
5	3	2	292
5	4	4	362
6	1	2	156
6	2	2	299
6	3	2	358
6	4	4	908
7	1	2	127
7	2	2	295
7	3	2	315
7	4	8	339

1. The numbers 3 to 7 in the first column stand for the numbers of the trials.

2. The numbers 1 to 4 in the second column represent the number of responses made by the subject in each trial.

3. The number 2 in the third column stand for a NEXT button push:

A. The first 2 represents the first NEXT button push: subject requested the context sentence.

B. The second 2 represents the second NEXT button push: subject understood the context sentence and requested the target sentence.

C. The third 2 represents the third NEXT button push: subject understood the target sentence and requested the question.

4. The number 4 in the third column represents a YES answer and the number 8 in the same column (trial 7) represents a NO answer: subject answered the question and requested the sentence NEXT TRIAL.

5. The numbers in the last column represent the time between each button push and the one before it:

A. Time opposite first 2: time for NEXT TRIAL.

B. Time opposite second 2: time it took the subject to understand the context sentence.

C. Time opposite third 2: time it took the subject to understand the target sentence (time of most interest to us).

D. Time opposite 4 or 8: time it took the subject to answer the question.

3. The Mingograph:

Some subjects pressed more buttons than the four buttons they were supposed to press in each trial. This was largely due to an occasional equipment failure. It so happened that sometimes a subject would press a button requesting a sentence but the tape recorder would fail to start and so he had to press the button again before the tape recorder would start.

Because the computer measured the time from a button push to the next button push regardless of the number of buttons pressed by the subject in each trial, extra button pushes made it difficult for us to know which time belongs to the target sentence. From the data presented by the computer, we could only know for sure which time belongs to the target sentence when the subject pressed the correct number of buttons in each trial. To illustrate, consider the example given below:

Subject 5 (Block 1): trial 22

22	1	2	177
22	2	2	220
22	3	2	377
22	4	2	426
23	1	4	371

In such cases as the example above, we were unable to tell for which sentence the subject pressed the NEXT button twice and therefore we were unable to know for sure which time belongs to which sentence. The subject may have pressed the NEXT button twice for the context sentence, the target or the question.

The problem we have been discussing was spotted during a number of practice trials before the experiment actually started. To overcome this problem, we felt that there was a need for an independent record of what each subject does during the experiment. The Mingograph was used to achieve just this purpose. Of the eight channels, four channels were used:

1. Channel 1: the sentences were recorded in this channel.
2. Channel 2: the NEXT button pushes were recorded in this channel.

3. Channel 3: the YES and NO button pushes were recorded in this channel.

4. Channel 4: the Stop tones were recorded in this channel.

A Mingograph record of a typical trial is given in Appendix 1, section 1.2. From the record provided by the Mingograph and when the subject pressed extra buttons in a particular trial (as in the example given above), we had no difficulty in finding the target sentence and the button pressed to request it as well as the button pressed to signal that it has been understood.

5.7 PROCEDURE:

Subjects were tested individually. Putting on a pair of head phones, the subject sat in front of the Control Box. The Tape Recorder, the Mingograph and the Computer were situated in another room so that all the subject could see was the Control Box. When the subject was given the signal to start, he pressed the START button to hear PRACTICE TEST or TEST ONE or TEST TWO depending on the test he was about to take. Each of these sentences was immediately followed by the sentence FIRST TRIAL. Once the subject heard that sentence, he pressed the NEXT button for the context sentence, then pressed it again for the target sentence and finally pressed it for the third time for the question. Once the subject heard the question, he pressed either the YES or NO button. Immediately after the subject answered the question, he heard the sentence NEXT TRIAL and went through the next trial in the same way as he went through the first and so on. The sentence LAST TRIAL introduced the last trial in each test. The subject was instructed to press the NEXT button as soon as he 'feels he has understood the sentence'.

He was also instructed to answer the question as soon as possible. Each subject went through a practice test which consisted of 9 trials before he went through the two experimental tests. A break of about 5 minutes was allowed between the practice test and the first test. During this break, the subject's understanding of the instructions was checked. Another break of about 2 minutes was allowed between the first and the second test. Note that the subject did not hear the tones (track 2). He only heard the sentences (track 1). The experiment was first run with the native speaker subjects and then with the non-native speaker subjects.

5.8 OBTAINING THE LISTENING TIME FOR EACH SENTENCE:

In chapter 4 we defined listening time for each sentence as the time from the end of the sentence to the next button push. The use of both the Computer and the Mingograph in this experiment meant that we had two sources from which we could obtain this time. What we did was to rely largely on the Mingograph rather than on the Computer to obtain the listening time for each sentence. This is because we found it easier to obtain this time from the record provided by the Mingograph than from the data presented by the Computer. As has been mentioned before, the Computer measured the time for each target sentence from the second NEXT button push to the third NEXT button push. If the time in which we are interested is the time from the end of the sentence to when the subject presses a button signalling that he has understood the sentence, then two steps must be followed if we were to obtain this time from the data provided by the Computer. The first step is to add the time from when the subject presses a button requesting a sentence up to when the sentence begins, to the time it took the informant to say the sentence. The next step is to subtract the total of these two times from the time provided by the Computer.

The resulting time would be the time from the end of the sentence to when the subject presses a button signalling that he has understood the sentence. To illustrate, let us refer to the time from when the subject presses the button to the time when the sentences begins as time X, the time which the informant took to say the sentence as time Y, the time provided by the Computer (time from a button push to the next button push) as time Z and the time from the end of the sentence to the next button push (listening time) as time S. Listening time (S) would be obtained by the following formula:

$S = Z - (X + Y)$

Note that if we use the data provided by the Computer, we would still need the Mingograph to provide us with times X and Y.

If, on the other hand, we use the data provided by the mingograph, we need not concern ourselves with times Z, X or Y. All that we need to do is to mark the end of each target sentence and using a ruler measure the time from the end of the sentence to where the subject presses the button signalling that he has understood the sentence. It is precisely this that we did (1 millimetre equals 1 centisecond). This, however, does not mean that we did not make use of the data given by the Computer. In some few occasions, the Mingograph failed to record the responses of particular subjects and so instead of regarding these responses as missing we decided to use the data provided by the Computer in order to obtain the times for the target sentences in those trials which the Mingograph failed to record.

5.9 METHOD OF ANALYSIS:

The analysis of the data required three steps:

1. The first step was to replace the missing values. A value was regarded as missing

A. When the subject answered the question about the sentence incorrectly. These represented 1.4% of the total.

B. When the subject pressed the button signalling that he has understood the sentence before the sentence is finished (minus values). These represented .6% of the total. Ideally, these values should not have been regarded as missing. However, the equipment was designed in such a way so that the tape recorder would only stop after the whole sentence is heard. This meant that when the subject pressed the button before the sentence is finished, he would still hear the whole sentence before he would hear the question. If he then answered the question correctly, we would not be able to know whether he understood the sentence before it is finished (predicted its content), or whether he understood it after it is finished (discovered that he would not be deprived of hearing the whole sentence before the question even if he pressed the button in the middle of the sentence). It is for this reason that minus values were regarded as missing.

To illustrate the procedure we have adopted to replace the missing scores (2% of the total), consider the following example taken from the experimental data. Subject 6 (a native speaker) answered the question about sentence 8 under treatment S+P incorrectly. The score associated with this sentence for this subject was therefore regarded as missing. To replace this missing score, we added the time which the other subjects (native speakers) took to understand sentence 8 (treatment S+P)to the time which subject 6 took to understand the other sentences under the same treatment as sentence 8.

The mean of the total of these scores was regarded as an estimate of the missing score. This estimate would reflect the overall subjects' performance with regard to sentence 8 as well as the performance of subject 6 with regard to the sentences under the same treatment as sentence 8.

2. The second step was to eliminate from the analysis two subjects, a native speaker and a non-native speaker. The native speaker (subject 14) was eliminated from the analysis because his responses were extremely slow in comparison with the responses of the other subjects. This suggests that, for some reason or another, this subject was not attending to the experiment in the same way as the other subjects. To provide statistical argument for eliminating this subject, we compared the deviation of this subject's total from the mean of Ss totals to the S.d. of Ss totals. This comparison showed that the grand total of subject 14 is greater than the mean of the subjects' totals by more than 2 [s.d. of subjects' totals]:

Grand total of subjects = 67463

Mean of subjects' totals = 67463 ÷ 14 = 4818.79

S.D. of subjects' totals = 1845.53

Grand total of subject 14 = 9340

Total 14 -- mean totals = 9340 -- 4818.79

= 4521.21

2 [s.d. of totals] = 2 x 1845.53 = 3691.06

4521.21 [total 14 - mean totals] is more than 3691.06 [[2 [s.d. of totals]]].

The treatments' totals for this subject and the treatments' totals for all the subjects with and without the eliminated subject are given in Appendix 1, section 1.3, sub-section 1.3.1:A.

There are two reasons why the non-native speaker was eliminated from the analysis:

A. In comparison with the other non-native speaker subjects, the treatment's totals for this subject were extremely wild. For example, his response time for the O+P treatment was 3973 centiseconds. This time is larger than the total time of 5 of the subjects in the same treatment. The treatments' totals for this eliminated subject and the treatments' totals for all the subjects with and without this subject are given in Appendix 1, section 1.3, sub-section 1.3.2:A.

B. If this subject was not eliminated, we would have 13 native speakers and 14 non-native speakers. For the purpose of the statistical analysis, it is more convenient to have an equal group size (13 natives and 13 non-natives) than an unequal group size (13 natives and 14 non-natives).

3. The final step was to carry out an analysis of variance on the 26 subjects' totals (analysis by subjects) and on the sentences' totals (analysis by sentences).

A schematic representation of the Experimental plan is given below:

1. By subjects:

	S		O	
	P	N	P	N
+N	X	X	X	X
-N	X	X	X	X

In this plan there are repeated measures on the Antecedent and the Anaphoric form factors. The type of subjects' factor is a grouping factor which has two levels (native speakers +N and non-native speakers -N).

2. By sentences:

	+N				-N			
	S		O		S		O	
Sen	P	N	P	N	P	N	P	N
1	X	X	X	X	X	X	X	X
.	.	.	.	.	.	.	.	.
12	X	X	X	X	X	X	X	X

In this plan there are repeated measures on all three factors.

Of most interest to us in the Experimental plan are:

A. Subjects' type and Antecedent interaction:

Summing the Pronoun and the noun, is the difference between the subject and the object for the native speakers the same or different from that between the subject and the object for the non-native speakers?

B. Subjects' type and Anaphoric form interaction:

Summing subject and object antecedents, is the difference between the pronoun and the noun for the native speakers the same or different from that between the pronoun and the noun for the non-native speakers?

In order to make detailed tests on the experimental hypotheses, the above Experimental plan was divided into the following six sub-plans:

1. Sub-plan 1:

In this sub-plan the native speakers were taken separately. A schematic representation of this plan is given below:

1. By subjects:

		S		O	
	Ss	P	N	P	N
	1	X	X	X	X
+N	.	X	X	X	X
	13	X	X	X	X

Repeated measures on the Antecedent and the Anaphoric form factors.

2. By Sentences:

Same as by subjects.

Of most interest to us in sub-plan 1 are:

A. Antecedent:

Difference between subject and object (Summing P and N)

B. Anaphoric form:

Difference between the pronoun and the noun (Summing S and O antecedents).

C. Antecedent and Anaphoric form interaction:

Is the difference between the pronoun and the noun when the antecedent is subject the same or different from that between the pronoun and the noun when the antecedent is object?

2. Sub-plan 2:

In this sub-plan the non-native speakers were taken separately. The forms of this sub-plan are the same as those of the previous sub-plan. The variables of interest to us in this sub-plan are also the same as those in the previous sub-plan. The only difference is that in sub-plan 2 the subjects were the non-native speakers.

3. Sub-plan 3:

A schematic r epresentation of this sub-plan is given below:

1. By subjects:

S

	P	N
+N	X	X
-N	X	X

2. By sentences:

S

	+N		-N	
Sen	P	N	P	N
1	X	X	X	X
.	.	.	.	.
12	X	X	X	X

Of most interest to us in this sub-plan are:

A. Subjects' type and Anaphoric form (antecedent subject) interaction:

When the antecedent is subject, is the difference between the pronoun and the noun for the native speakers the same or different from that between the pronoun and the noun for the non-native speakers?

B. Anaphoric form (antecedent subject):

B.1 P v. N (antecedent subject) : Native speakers.

B.2 P v. N (antecedent subject) : Non-native speakers.

4. Sub-plan 4:

The forms of this sub-plan are the same as those of sub-plan 3. The variables of interest in this sub-plan are also the same as those in sub-plan 3. The only difference is that whereas in sub-plan 3 the antecedent for the anaphoric form is the subject, in sub-plan 4 the antecedent is the object.

5. Sub-plan 5:

A schematic representation of this sub-plan is given below:

1. By subjects:

P

	S	P
+N	X	X
-N	X	X

2. By sentences:

P

	+N		-N	
Sen	S	O	S	O
1	X	X	X	X
.	.	.	.	.
12	X	X	X	X

Of most interest to us in this sub-plan are:

A. Subjects' type and Antecedent (anaphoric form pronoun) interaction:

When the anaphoric form is the pronoun, is the difference between the subject and the object for the native speakers the same or different from that between the subject and the object for the non-native speakers?

B. Antecedent (anaphoric form pronoun):

B.1. S v. O (anaphoric form pronoun): Native speakers.

B.2. S v. O (anaphoric form pronoun): Non-native speakers.

6. Sub-plan 6:

The forms of this sub-plan are the same as those of the previous sub-plan. The variables of interest are also the same as those in sub-plan 5.

The only difference between this sub-plan and the previous sub-plan is that whereas in the previous sub-plan the anaphoric form is the pronoun, in this sub-plan the anaphoric form is the noun.

The analysis of variance by subjects and by sentences was performed on the Experimental Plan and each of the six sub-plans. In addition to the F-ratio by subjects (F1) and the F-ratio by sentences (F2), the statistic min F' was also computed.

5.10 RESULTS:

1. The experimental plan:

The summary of the analysis of variance by subjects is given in Appendix 1, section 1.4, sub-section 1.4.1: C and the summary of the analysis of variance by sentences is given in Appendix 1, section 1.4, sub-section 1.4.2: C. The results concerning the variables of most interest are given below:

A. Subjects' type and Antecedent interaction:

The native speakers' and the non-native speakers' mean times for the Subject and the Object are given in table 5.10.1.

Table 5.10.1: Native speakers' and non-speakers' mean times for the Subject and the Object:

	S	O
+N	96.4	89.9
-N	86.9	83.6

The interaction of subjects' type and antecedent was not reliable by all measures:

F1 < 1

F2 (1,11) = 1.6, P > .05

Min F' < 1

As could be seen from the means in table 5.10.1, the Object was faster than the Subject for both types of subjects.

B. Subjects' type and Anaphoric form interaction:

The native speakers' and the non-native speakers' mean times for the Pronoun and the Noun are given in table 5.10.2.

Table 5.10.2: Native speakers' and non-native speakers' mean times for the Pronoun and the Noun:

	P	N
+N	93.1	93.2
-N	88.3	82.1

The subjects' type and anaphoric form interaction was reliable by subjects, marginally reliable by sentences and not reliable by min F':

F1 (1,24) = 6.16, P < .025

F2 (1,11) = 4.7, (Critical for P = .05 is 4.84)

Min F' (1,27) = 2.67, P > .05

In order to gain insight into the nature of this interaction, we have plotted it in Figure 5.10.1 below. From this figure, it could be seen that for the native speakers the Pronoun and the Noun were alike whereas for the non-native speakers the Noun was faster than the Pronoun. Gillian Brown (personal communication) recommended using these figures rather than the standard interaction figures. She argued that the latter figures are misleading in that they imply a gradient between the listening time of the pronoun and the listening time of the noun.

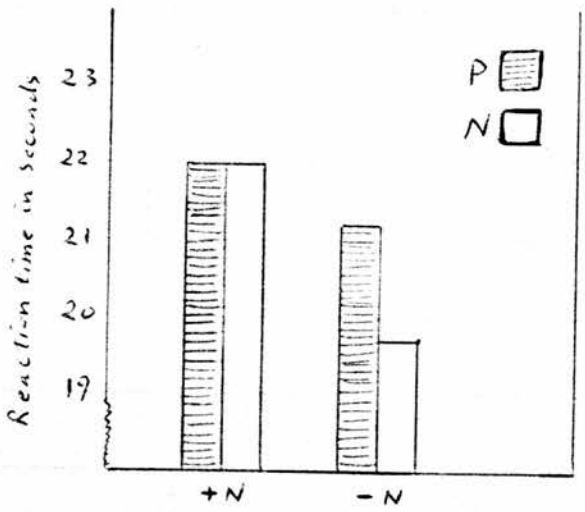


Figure 5.10.1: A plot of the subjects' type and anaphoric form interaction.

The triple interaction of subjects' type X antecedent X anaphoric form was not reliable by all measures:

F1 (1,24) = 1.64, P $>$ .05

F2 $<$ 1

Min F' $<$ 1

2. Sub-plan 1:

The summary of the analysis of variance by subjects is given in Appendix 1, section 1.5, sub-section 1.5.1: D and the summary of the analysis of variance by sentences is given in Appendix 1, section 1.5, sub-section 1.5.2:D.

A. Antecedent:

The native speakers interpreted the object referent an average of 6.5 centiseconds faster than the subject referent (see table 5.10.1 above). This effect did not approach the significance level by all measures:

F1 (1,12) = 3.45, P > .05

F2 (1,11) = 1.22, P > .05

Min F' < 1

B. Anaphoric form:

For the native speakers, the Pronoun was faster than the Noun by an average of .1 centiseconds. This effect was not reliable by all measures with min F' and the individual Fs by subjects and sentences all having a value of less than 1.

C. Antecedent and Anaphoric form interaction (native speakers):

The native speakers' mean times for the pronoun and the noun when the antecedent is subject and object are given in table 5.10.3.

Table 5.10.3: Native speakers' mean times for the pronoun and the noun (antecedent subject and object).

		P	N
+N	S	94	98.7
	O	92.1	87.8

The interaction of antecedent and anaphoric form was reliable by subjects only:

F1 (1,12) = 16.81, P < .005

F2 (1,11) = 3.75, P > .05

Min F' (1,16) = 3.07, P > .05

In order to gain insight into the nature of this interaction, we have plotted it in figure 5.10.2 below.

As could be seen from this figure, the pronoun was faster than the noun when the antecedent is subject whereas the noun was faster than the pronoun when the antecedent is object. Note also that the difference between the subject and the object was greater when the anaphoric form is the noun than when it is the pronoun.

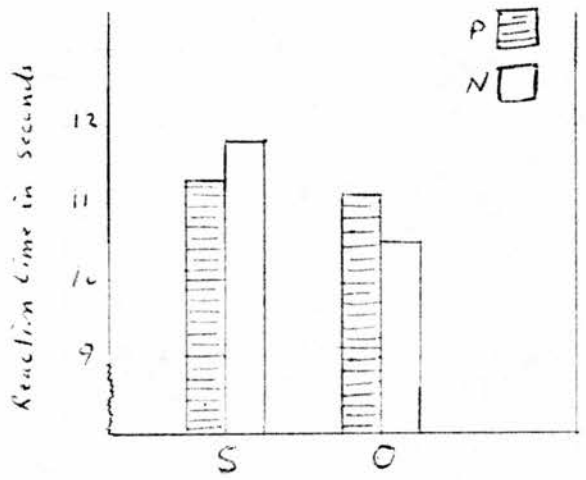


Figure 5.10.2: A plot of the Antecedent and the Anaphoric form interaction (subjects: native speakers).

3. Sub-plan 2:

The summary of the analysis of variance by subjects is given in Appendix 1, section 1.6, sub-section 1.6.1:D and the summary of the analysis of variance by sentences is given in Appendix 1, section 1.6, sub-section 1.6.2:D.

A. Antecedent:

The non-native speakers interpreted the object referent an average of 3.3 centiseconds faster than the subject referent (see table 5.10.1 above). This effect was not reliable by all measures:

F1 (1,12) = 1.59, P > .05

F2 < 1

Min F' < 1

B. Anaphoric form:

For the non-native speakers, the noun was faster than the pronoun by an average of 6.2 (see table 5.10.2 above). This effect was reliable by all measures:

F1 (1,12) = 10.82, P < .01

F2 (1,11) = 7.9, P < .025

Min F' (1,22) = 4.57 P < .05

C. Antecedent and Anaphoric form interaction (non-native speakers):

The non-native speakers' mean times for the pronoun and the noun when the antecedent is subject and object are given in table 5.10.4.

Table 5.10.4: Non-native speakers' mean times for the pronoun and the noun (antecedent subject and object).

-N

	P	N
S	89	84.9
O	87.7	79.5

The antecedent and the anaphoric form interaction (subjects: non-native speakers) was not reliable by all measures:

F1 (1,12) + 1.7, P > .05

F2 (1,11) = 1.12, P > .05

Min F' < 1

Figure 5.10.3. below shows the absence of a significant interaction between the antecedent and the anaphoric form (subjects: non-native speakers). From this figure, it could be seen that for the non-native speakers the noun was faster than the pronoun when the antecedent is subject or object.

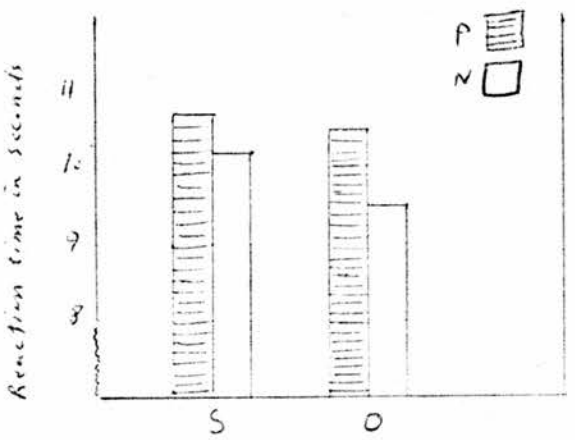


Figure 5.10.3: Absence of significant interaction between the Antecedent and Anaphoric form (non-native speakers).

4. Sub-plan 3:

The summary of the analysis of variance by subjects is given in Appendix 1, section 1.7, sub-section 1.7.1:C and the summary of the analysis of variance by sentences is given in Appendix 1, section 1.7, sub-section 1.7.2:C.

The results concerning the variables of interest are given below:

A. Subjects' type and anaphoric form (antecedent subject) interaction:

The native speakers' and the non-native speakers' mean times for the pronoun and the noun when the antecedent is subject are given in table 5.10.5.

Table 5.10.5: Native speakers' and non-native speakers' mean times for the pronoun and the noun (antecedent subject).

	S	
	P	N
+N	94	98.7
-N	89	84.9

The interaction of subjects' type and anaphoric form (antecedent subject) was reliable by subjects, marginally reliable by sentences and not reliable by min F':

F1 (1,24) = 15.24, P $<$ .001

F2 (1,11) = 4.19, (critical for P = .05 is 4.84

Min F' (1,17), = 3.29 P $>$ .05

In order to gain insight into the nature of this interaction, we have plotted it in figure 5.10.4 below. From this figure it could be seen that when the antecedent is subject, the pronoun was faster than the noun for the native speakers whereas the noun was faster than the pronoun for the non-native speakers.

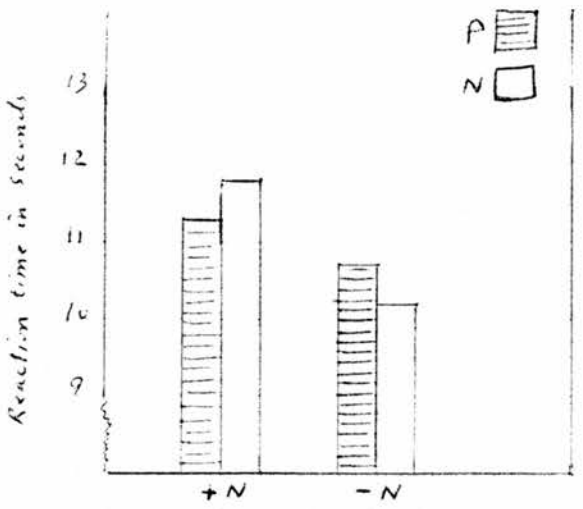


Figure 5.10.4: A plot of the subjects' type and the anaphoric form (antecedent subject) interaction.

B. Anaphoric form (antecedent subject):

B.1: The native speakers understood the pronoun sentences an average of 4.7 centiseconds faster than the noun sentences (see table 5.10.5). This effect was reliable by subjects but not reliable by sentences or min F':

F1 (1,24) = 6.63, P $<$ .01

F2 (1,11) = 2.27, P $>$ .05

Min F' (1,17) = 1.18, P $>$ .05

B.2: The non-native speakers understood the noun sentences an average of 4.1 centiseconds faster than the pronoun sentences. (See table 5.10.5). This effect was reliable by subjects but unreliable by sentences or by min F':

F1 (1,24) = 6.68, P $<$ .025

F2 (1,11) = 1.43, P $>$ .05

Min F' (1,16) = 1.18, P $>$ .05

5. Sub-plan 4:

The summary of the analysis of variance by subjects is given in Appendix 1, section 1.8, sub-section 1.8.1: C and the summary of the analysis of variance by sentences is given in Appendix 1, section 1.8, sub-section 1.8.2: C. The results concerning the variables of most interest are given below:

A. Subjects' type and anaphoric form (antecedent object) interaction:

The native speakers' and the non-native speakers' mean times for the pronoun and the noun when the antecedent is object are given in table 5.10.6.

Table 5.10.6: Native speakers' and non-native speakers' mean times for the pronoun and the noun (antecedent object).

	O	
	P	N
+N	92.1	87.8
-N	87.7	79.5

The interaction of subjects' type and anaphoric form (antecedent object) was unreliable by all measures with min F' and the individual Fs by subjects and sentences all having a value of less than 1. Figure 5.10.5 shows the absence of interaction between the subjects' type and anaphoric form (antecedent object). From this figure, it could be seen that when the antecedent is object, the noun was faster than the pronoun for both types of subjects.

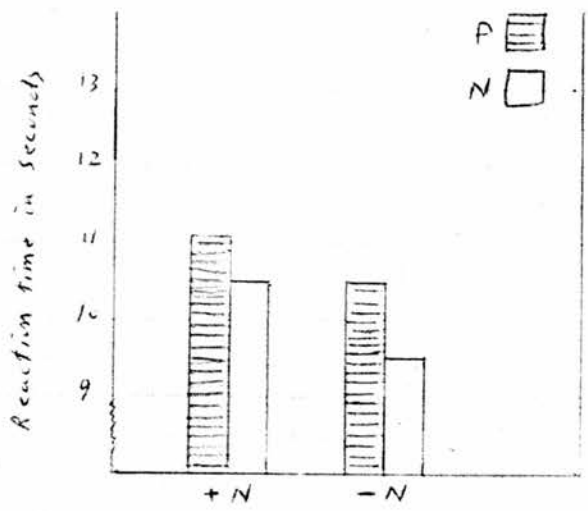


Figure 5.10.5: Absence of interaction between subjects' type and anaphoric form (antecedent object).

B. Anaphoric form (antecedent object):

B.1 The native speakers understood the noun sentences an average of 4.3 centiseconds faster than the pronoun sentences (see table 5.10.6). This effect was unreliable by all measures:

$F1\ (1,24) = 2.47,\ P > .05$

$F2\ (1,11) = 1.47,\ P > .05$

Min $F' < 1$

B.2 The non-native speakers understood the noun sentences an average of 8.2 centiseconds faster than the pronoun sentences (see table 5.10.6).

This effect was reliable by all measures:

F1 (1,24) = 8.82, P $<$ .01

F2 (1,11) = 12.7, P $<$ .005

Min F' (1,34) = 5.21, P $<$ .05

6. Sub-plan 5:

The summary of the analysis of variance by subjects is given in Appendix 1, section 1.9, sub-section 1.9.1:C and the summary of the analysis of variance by sentences is given in Appendix 1, section 1.9, sub-section 1.9.2: C. The results concerning the variables of interest are given below:

A. Subjects' type and antecedent (anaphoric form: pronoun) interaction.

B. Antecedent (anaphoric form: pronoun):

B.1 For the native speakers.

B.2 For the non-native speakers.

There was no reliable effect in either A, B1 or B2: all nine F- ratios have a value of less than 1.

7. Sub-plan 6:

The summary of the analysis of variance by subjects is given in Appendix 1, section 1.10, sub-section 1.10.1: C and the summary of the analysis of variance by sentences is given in Appendix 1, section 1.10, sub-section 1.10.2:C. The results concerning the variables of interest are given below:

A. Subjects' type and antecedent (anaphoric form: noun) interaction:

The native speakers' and the non-native speakers' mean times for the subject and the object (anaphoric form: noun) are given in table 5.10.7.

Table 5.10.7: Native speakers' and non-native speakers' mean times for the subject and the object (anaphoric form: noun).

	N	
	S	O
+N	98.7	87.8
-N	84.9	79.5

The interaction of the subjects' type and the antecedent (anaphoric form: noun) was not reliable by all measures:

F1 (1,24) = 1.11, P > .05

F2 (1,11) = 2.16, P > .05

Min F' < 1

B. Antecedent (anaphoric form: noun):

B.1 When the anaphoric form is the noun, the native speakers interpreted the object referent an average of 10.9 centiseconds faster than the subject referent (see table 5.10.7). This effect was reliable by subjects but unreliable by sentences or min F':

F1 (1,24) = 8.62, P < .01

F2 (1,11) = 3.79, P > .05

Min F' (1,21) = 2.63, P > .05

B.2 When the anaphoric form is the noun, the non-native speakers interpreted the object referent an average of 5.4 centiseconds faster than the subject referent (see table 5.10.7).

This effect was unreliable by all measures:

F1 (1,24) = 2.1, P > .05

F2 (1,11) = 1.99, P > .05

Min F' (1,30) = 1.02, P > .05

8. Summary of the results:

1. A. Summing P and N, the difference between the subject and the object for the native speakers did not differ significantly from that between the subject and the object for the non-native speakers. The object was faster than the subject for both types of subjects. However, this difference between the object and the subject was unreliable for both the native and the non-native speakers.

B. When the anaphoric form is the pronoun, the difference between the subject and the object for the native speakers did not differ significantly from that betweenthe subject and the object for the non-native speakres. The object was faster than the subject for both types of subjects. However, this difference between the object and the subject (anaphoric form: pronoun) was not reliable for both the native and the non-native speakers.

C. When the anaphoric form is the noun, the difference between the subject and the object for the native speakers did not differ significantly from that between the subject and the object for the non-native speakers. The object was faster than the subject for both types of subjects. For the native speakers, and when the anaphoric form is the noun, the object was significantly faster than the subject (reliable by subjects).

For the non-native speakers, and when the anaphoric form is the noun, the difference between the subject and the object did not approach significance level.

2. A. Summing S and O, the difference between the pronoun and the noun for the native speakers differed significantly from that between the pronoun and the noun for the non-native speakers (reliable by subjects, marginally reliable by sentences). For the native speakers, and summing S and O, the pronoun and the noun were alike. For the non-native speakers, and summing S and O, the noun was significantly faster than the pronoun (reliable by all measures).

B. When the antecedent is subject, the difference between the pronoun and the noun for the native speakers differed significantly from that between the pronoun and the noun for the non-native speakers (reliable by subjects, marginally reliable by sentences). For the native speakers, and when the antecedent is subject, the pronoun was significantly faster than the noun (reliable by subjects). For the non-native speakers, and when the antecedent is subject, the noun was significantly faster than the pronoun (reliable by subjects).

C. When the antecedent is object, the difference between the pronoun and the noun for the native speakers did not differ significantly from that between the pronoun and the noun for the non-native speakers. The noun was faster than the pronoun for both types of subjects. For the native speakers, and when the antecedent is object, this difference between the noun and the pronoun did not approach significance level.

For the non-native speakers, and when the antecedent is object, the noun was significantly faster than the pronoun (reliable by all measures).

3. A For the native speakers, the difference between the pronoun and the noun when the antecedent is subject differed significantly from that between the pronoun and the noun when the antecedent is object, (reliable by subjects). When the antecedent is subject, the pronoun was significantly faster than the noun whereas when the antecedent is object, the noun and the pronoun were alike.

B. For the non-native speakers, the difference between the pronoun and the noun when the antecedent is subject did not differ significantly from that between the pronoun and the noun when the antecedent is object. In both cases, the noun was significantly faster than the pronoun.

9. Subsidiary analysis: was there any correlation between the length of the context sentences and response time?

A. Native speakers:

1. Length in words and reaction time:

There was a significant negative correlation between the length of the context sentences in words and response time [$r = -.5$, with 22 df, significance level = .02 (two-tailed test). Thus, the longer the sentence in words, the shorter the time it took the subjects to signal that they have understood it. Put differently, the shorter the sentence in words, the longer the time it took the subjects to signal that they have understood it.[1]

2. Length of sentences in time and reaction time:

There was an unreliable negative correlation between the length of the context sentences in time and reaction time [r =-.33 / 22 df, critical value at the 5 percent level for the two-tailed test =-.404].

B. Non-native speakers:

1. Length in words and reaction time:

As with the native speakers, there was also a significant negative correlation between the length of the context sentences in words and reaction time [r = - .7 / with 22 df significant at the 1 percent level (two-tailed test).

2. Length in time and reaction time:

There was an unreliable negative correlation between length in time and reaction time [r = - .29].

5.11 DISCUSSION:

5.11.1 Explaining the native speakers' results:

As predicted, when the referent is current subject, the pronoun was faster than the noun whereas when the referent is current object, the pronoun and the noun were alike. Furthermore, when the anaphoric form is the noun, the object referent was faster than the subject referent whereas when the anaphoric form is the pronoun, the object and the subject referents were alike. There are two different explanations for these results.

1. Explanation 1:

This explanation is based on the difference between the meaning of the pronoun and the repeated noun (Halliday and Hasan, 1976; Crymes, 1968; Bloomfield, 1933; Lesgold, 1972) and the difference between the cognitive accessibility of the subject and the object referents (Chafe, 1976; Sanford and Garrod, 1978).

According to Halliday and Hasan, Crymes, Bloomfield, and Lesgold, the pronoun, unlike the noun, explicitly signals to the listener that its referent is the same as that of the antecedent. To illustrate, consider the example given below:

1. John hit Mary. a. He / b. John was angry.

In 1a, the listener will have no doubt that the pronoun He refers to the same individual referred to by John whereas in 1b, the listener will not be able to know for sure whether the referent of the second John is the same or different from that of the first John. Consequently, the pronoun should work better than the noun. As the results of this experiment showed, the pronoun did work better than the noun but only when the antecedent is surface subject. When the antecedent is object, the pronoun and the noun were alike.

In order to explain why the pronoun worked better than the noun when the antecedent is subject whereas the pronoun and the noun were equally effective when the antecedent is object, and in order to explain why the object was faster than the subject when the anaphoric form is the noun, this argument concerning the difference between the meaning of the pronoun and the noun must be modified by taking into consideration the difference between the cognitive accessibility of the subject and the object referents. The modified argument runs as follows:

A. The referent of the surface subject, unlike that of the surface object, has a special 'discourse' status. The referent of the subject is what the message is about whereas the referent of the surface object is part of what is being said about the subject's referent.

As a result, and as Chafe (1976) argues, the referent of the surface subject may be more readily accessible than that of the surface object. To use a metaphor employed by Sanford and Garrod (1978), the listener allocates a bigger workspace in memory for the representation of the surface subject's referent than for the representation of the surface object's referent. As we have argued before, if the pronoun is to work better than the noun, then the referent must be readily accessible. If the referent of the surface object is not as readily accessible as that of the surface subject, then the noun may be used to refer back to the surface object's referent without the listener being confused. In this case, unlike the case where the antecedent is surface subject, the repetition of the noun may be thought of (by the listener) as a reinstatement of a referent to which he has not paid great attention - ie. to which he has not allocated a big workspace in memory. To illustrate, consider 2 below and compare it with 1 above:

2. John kissed Mary. a. She / b. Mary was happy.

in 1, the referent is introduced by a noun phrase functioning as surface subject whereas in 2, the referent (Mary) is introduced by a noun phrase functioning as surface object. On the basis of this argument, 'John' in 1 should be more readily accessible than 'Mary' in 2. If 'John' in 1 is readily accessible, then there is no justification to repeat John to refer back to 'John'. If 'Mary' in 2 is less accessible than 'John' in 1, then there is a justification for repeating Mary to refer back to 'Mary'. The repetition of Mary may be regarded by the listener as a reinstatement of 'Mary', a referent to which he has allocated a small workspace in memory.

B. The claim which is often being made in the literature is that the difference between the cognitive accessibility of the subject and the object referents is due to the difference between the 'discourse' status of the two referents. Chafe (1976) refers to the 'discourse' status of the subject as 'subjecthood' and we may refer to that of the object as 'objecthood'. Clearly, in this experiment the referent of the surface subject has not only the privileged 'discourse' status 'subjecthood' but also the privileged 'semantic' status 'agenthood' and the referent of the surface object has not only the less privileged 'discourse' status 'objecthood' but also the less privileged 'semantic' status-'agenthood'. If this is so, then the difference between the cognitive availability of the subject and the object referents may be due to the difference between the 'discourse' status of the two referents (subjecthood v. objecthood), or to the difference between the 'discourse' and the 'semantic' statuses of the two referents (subjecthood + agenthood v. objecthood + - agenthood), or simply to the difference between the 'semantic' status of the two referents (+ agenthood v. - agenthood).

C. According to James (1972), if inherent differences among subject and object nouns are not eliminated, then the difference between the cognitive availability of the subject and the object referents may be attributed not to the differnece between the 'discourse' status of the two referents but to the inherent differences among subject and object nouns. Such inherent differences include, among other things, the difference between the image-value of subject and object nouns.[2] In this experiment, no attempt was made to equate the image-value of the subject and the object nouns.

As a result, and as James rightly observes, all the subject nouns are animate whereas only 8 of the 12 object nouns are animate. To find out whether the difference obtained between the subject and the object referents (anaphoric form: noun) was influenced by whether the subject and the object nouns have the same image-value or not, we compared the difference between the subject and the object in those sentences in which the subject and the object nouns do not have the same image-value (sentences 1,5,7 and 12) to the difference between the subject and the object in those sentences in which the subject and the object nouns have the same image-value (the remaining sentences).

This analysis indicated that differences between the subject and the object (anaphoric form: noun) may have been influenced by the difference in image-value among subject and object nouns. For those sentences in which the subject nouns are animate whereas the object nouns are inanimate (sentences 1,5,7 and 12) the object was faster than the subject an average of 16.6 centiseconds. For those sentences in which the subject and the object nouns are animate, the object was faster than the subject an average of 8.1 centiseconds.

Thus, although when the anaphoric form is the noun the object was faster than the subject in both types of sentences, the difference between the object and the subject was considerably greater in those sentences in which the object and the subject nouns differ in their image-value (subject nouns: animate whereas object nouns: inanimate) than in the sentences in which the object and the subject nouns have the same image-value.

This would suggest that the object referent is far less accessible than the subject referent in sentences 1, 5, 7 and 12 than in the remaining sentences. Put differently, the subject referent is far more readily accessible than the object referent in sentences 1, 5, 7 and 12 than in the remaining sentences. As a result, and when the anaphoric form is the noun, the object referent was much faster than the subject referent in sentences 1, 5, 7 and 12 than in the remaining sentences.

Note that, however, if inherent differences among subject and object nouns influence the difference between the cognitive accessibility of the subject and the object referents, then this should not only be reflected on the difference between the subject and the object in sentences 1, 5, 7 and 12 as compared with that between the subject and the object in the remaining sentences but also on the difference between the pronoun and the noun for the subject versus the difference between the pronoun and the noun for the object in sentences 1, 5, 7 and 12 as compared with the difference between the pronoun and the noun for the subject versus the difference between the pronoun and the noun for the object in the remaining sentences. If the claim that inherent differences in image-value among subject and object nouns have a <u>crucial</u> role to play is to be further supported, then in the sentences in which the subject and the object nouns have the same image-value (subject and object referents are equally accessible),

the difference between the pronoun and the noun for the subject should be similar to that between the pronoun and the noun for the object whereas in the sentences in which the subject and the object nouns differ in terms of their image-value (subject nouns: animate; object nouns: inanimate) the pronoun may be faster than the noun for the subject whereas there may be no difference between the pronoun and the noun for the object (object referents less accessible than subject referents: differences in image-value).

Examination of the date showed no further support for this claim. In sentences 1, 5, 7 and 12 (subject nouns are animate whereas object nouns are inanimate), the pronoun was faster than the noun for the subject and the object. In the remaining sentences (both subject and object nouns are animate), the pronoun was faster than the noun for the subject whereas the opposite was true for the object. Thus, it seems that there is only partial evidence to support the claim that inherent differences among subject and object nouns are related to the difference between the cognitive accessibility of the subject and the object referents. Nevertheless, in the third experiment (reported in chapter 7) where the investigation of the difference between the subject and the object referents is continued, the subject and the object nouns were carefully equated in terms of their image-value.

2. Explanation 2:

The second explanation rejects the two claims on which the first explanation is based. Below we will take each of these claims in turn.

A. The referent of the pronoun is the same as that of the antecedent whereas the referent of the noun may or may not be the same as that of the antecedent.

According to the second explanation, if the message is considered within a communicative situation and not merely as an example in a textbook, then it is highly unlikely that the listener will not take the referent of the noun as being the same as that of its antecedent. This is because the listener assumes, among other things, that the speaker has no intention of deceiving or misleading him. Thus, if the speaker repeats the noun to refer back to a current referent, the listener has every reason to believe that the same individual is being talked about. Put differently, the listener has no reason to believe that the same referent is not being talked about when the noun is repeated (as far as "communicative rules" are concerned).

B. The subject referent is more readily accessible than the object referent.

The second explanation argues that there are two problems with this claim:

1. Whereas the subject's referent has a privileged 'discourse' or 'semantic' status, the object's referent has a privileged status of a different kind. In the case of the surface object's referent, no other intervening referents separate the first and the second mentions of the referent. In the case of the surface subject's referent, on the other hand, one intervening referent (an object referent) separates the first and the second mentions of the referent.

According to the 'continuity model' (Clark and Sengul, 1979), the further back the listener has to search for a referent, the more difficult it becomes to identify that referent. Thus, there is one argument which says that the referent of the subject may be granted a privileged status in memory because of its 'discourse' or/and its 'semantic' status and there is another argument which says that the referent of the object may be granted a privileged status in memory because it is mentioned more recently in the discourse. If the 'discourse' and the 'semantic' factors work better for the subject referent than they do for the object referent but if the 'recency' factor work better for the object referent than it does for the subject referent, then there may be no difference between the cognitive accessibility of the subject and the object referents.

2. If we assume that the referent of the subject is more readily accessible than the referent of the object then this should lead not only to the object referent being interpreted more rapidly than the subject referent when the anaphoric form is the noun but also to the subject referent being interpreted more rapidly than the object referent when the anaphoric form is the pronoun. Although the results of the experiment showed that the object was faster than the subject when the anaphoric form is the noun, they did not show that the subject was faster than the object when the anaphoric form is the pronoun. When the anaphoric form is the pronoun, the subject and the object were alike.

If the claims on which the first explanation is based could be refuted then how can the results obtained in this experiment be explained? The second explanation is based on the argument presented by Bolinger (1977, 1979).

According to this second explanation, the noun may be repeated in order to re-introduce a surface object's referent as a surface subject' referent. If, on the other hand, a referent has already been presented as surface subject, then there is no reason to repeat the noun to refer back to that referent. Listeners expect a surface subject's referent to be referred back to by the pronoun rather than by the noun. To illustrate, consider once more 1 and 2 which are given below as 3 and 4:

3. John hit Mary. He / John was angry.

4. John kissed Mary. She / Mary was happy.

In the first sentence in 4, 'Mary' is introduced as a surface object's referent (the sentence is not about 'Mary'). In the second sentence, however, 'Mary' is reintroduced as a surface subject's referent (the second sentence is about 'Mary'). For this reason, the noun may be repeated to refer back to 'Mary'. The repetition of Mary in 4 conveys something new to the listener though not at the 'cognitive' level but at the 'thematic' level ie. 'Mary', which has been introduced as a surface object referent, is now being introduced as a surface subject referent. In the case of 3, on the other hand, 'John' has already been introduced as surface subject and thus there is no justification to repeat John to refer back to 'John'.

To sum up the discussion so far, two different explanations for the results of the experimetn were discussed.

The first explanation claims that:

A. The pronoun unambiguously identifies the referent whereas the noun is ambiguous between referring to the intended referent and referring to a different referent.

B. Current object referents are less accessible than current subject referents. On the basis of this, the first explanation argues that there is more reason to repeat the noun to refer back to a current object referent than there is to repeat the noun to refer back to a current subject referent. The repetition of the noun to refer back to a [CO] referent may be thought of (by the listener) as a reinstatement of a referent to which he has not paid great attention.

The second explanation rejects the two claims made by the first explanation. According to this second explanation, the difference between the pronoun and the noun for [CS] referents as compared with that between the pronoun and the noun for [CO] referents and the difference between [CS] and [CO] referents (anaphoric form: noun) are most likely to be due to the difference between the 'thematic' functions of pronouns and nouns for [CS] referents as opposed to [CO] referents.

Fortunately, one of the claims made by the first explanation (claim A) is testable. The second experiment (reported in the following chapter) was designed to achieve just this purpose.

Note that although the results concerning the difference between the pronoun and the noun for the subject as compared with that between the pronoun and the noun for the object (antecedent and anaphoric form interaction) may be explained in terms of either explanation 1 or 2 or both, there is a possibility that this result may have been influenced

by the difference in length (in words) between the pronoun and the noun sentences (antecedent subject) as compared to that between the pronoun and the noun sentences (antecedent object). In 5 of the subject sentences, the pronoun and the noun sentence have the same length in words (e.g. he / John...) whereas in the remaining 7 sentences the noun sentence is one word longer than the pronoun sentence (e.g. she / the widow....). In the case of the object sentences, on the other hand, the pronoun and the noun sentences have the same length in words in only 2 sentences. In the remaining object sentences (10 sentences), the noun sentences are one word longer than the pronoun sentences. The analyis of the context sentences showed that reaction time decreases with the increase in the number of words in the sentence. To find out whether this would also be reflected on the target sentences, we compared the total times of the subject and the object target sentences in which the pronoun and the noun sentences have the same length in words to the total times of the subject and the object target sentences in which the noun sentences are one word longer than the pronoun sentences. From this analysis, it was observed that in each of the sentences in which the pronoun and the noun sentences have the same length in words (regardless of whether they are subject or object sentences), the pronoun was faster than the noun. On the other hand, in the sentences in which the noun sentences are longer (in words) than the pronoun sentences (regardless of whether they are subject or object sentences) the noun was faster than the pronoun in 12 of the 17 sentences.

Because there are 5 subject sentences in which the pronoun and the noun sentences have the same length in words as compared to only 2 object sentences in which the pronoun and the noun sentences have the same length in words or because there are 10 object sentences in which the noun sentences are longer than the pronoun sentences as compared to only 7 subject sentences in which the noun sentences are longer than the pronoun sentences, it is possible that the obtained difference between the pronoun and the noun when the antecedent is subject as compared to that between the pronoun and the noun when the antecedent is object may have been influenced by this difference in length between the pronoun and the noun sentences (antecedent subject) as compared with that between the pronoun and the noun sentences (antecedent object). Note, however, that this possible confounding variable of length did not seem to have an effect on the difference between the subject and the object when the anaphoric form is the noun. Five of the subject and the object noun sentences have exactly the same length in words. In each of these sentences the object was faster than the subject. Even in all those sentences where the subject noun sentences are actually longer than the object noun sentences (sentences 4, 6 and 11) the object was faster than the subject. In the third experiment where the difference between the pronoun and the noun for the subject as compared with that between the pronoun and the noun for the object is further investigated, this confounding variable of length was completely eliminated: the difference between a pronoun and a noun sentence for a subject sentence is the same as that between the pronoun and the noun sentence for its object counterpart.

5.11.2 Relating the results of this study to other similar studies.

1. Pronoun v. Noun:

To date, we know of only two experiments which have been performed to investigate the difference between pronouns and repeated nouns when there are no intervening sentences. The results of the experiment reported by Lesgold (1972) showed that the subjects were able to relate two items to the same concept better when the second item is the pronominal form of the first item than when it is the repetition of the first item. Lesgold, however, does not seem to be aware of the distinction we have made between the first mentioning of a referent by a noun phrase functioning as surface subject and the first mentioning of a referent by a noun phrase functioning as surface object and the effect this distinction might have on the difference between pronouns and repeated nouns. Since Lesgold did not give all the sentences he used in the experiment, we are unable to tell whether most of the concepts were introduced by a noun phrase functioning as surface subject or by a noun phrase functioning as surface object. Consequently, no direct comparison could be made between the results of Lesgold's experiment and those of our experiment. If most of the concepts in Lesgold's experiment were introduced by noun phrase functioning as surface subject, then the obtained results would give some support to what we have found about the difference between the pronoun and the noun when the antecedent is subject.

The difference between pronouns and repeated nouns was also investigated in an experiment performed by Richek (1976 - 1977).

Unlike Lesgold, Richek used an equal number of subject and object antecedents. However, the subject and the object nouns were not used in the experiment in order to find out whether the difference between pronouns and nouns for the subject is the same or different from that between pronouns and nouns for the object but in order to find out whether the subjects will find it easier to answer questions about the subject than questions about the object. The results of Richek's experiment showed that the subjects found it easier to comprehend the noun than the pronoun. Moreover, the subjects found it more difficult to answer questions about the object than questions about the subject. The following points should be noted about Richek's experiment:

A. The subjects in Richek's experiment, unlike those in our experiment, were school children. Richek was concerned with demonstrating that the school-age child's understanding of syntax, unlike that of the educated adult native speaker, is incompletely developed. On this basis, Richek argued that for the school-age child the less lexical information an anaphoric form contains, the more difficult it becomes to comprehend. Her hypothesis was, therefore, that the pronoun would be more difficult to comprehend than the noun. For the eductated adult native speaker, the opposite of Richek's argument is assumed to be true. To quote Crymes once more:

> Substitutes serve dispatch because the lexical information that they carry is less than that carried by replaced items; they serve clarity because the grammatical information that they carry is more. (1968, p 32).

B. Although Richek used both subject and object noun antecedents, she did not perform a separate analysis on the pronoun and the noun sentences for each of the antecedents' type.

Thus, we are unable to tell whether the difference (in Richek's experiment) between the pronoun and the noun for the subject is the same or different from that between the pronoun and the noun for the object.

C. Richek's finding that questions about the subject were easier to answer than questions about the object supports the view that the subject referent may be more readily accessible than the referent of the object.

D. Richek does not seem to be aware of or does not seem to agree with the claim that the referent of the pronoun is the same as that of the antecedent whereas the referent of the repeated noun may or may not be the same as that of the antecedent. As a result, the subjects were not tested on the validity of this claim. The subjects were simply asked to supply the referent which was assumed to be one and the same regardless of whether the pronoun or the noun is used. This becomes apparent from examining the experimental technique adopted by Richek. The subjects were presented with sentences like 5 below and they were supposed to supply the referent:

5. John saw Mary and he / John said hello to her.

Who said hello to her?

In answering the question about the noun sentences, the subject need not concern himself with whether the referent of the second John is the same or different from that of the first John. It is implied (by the investigator) that the second John refers to the same individual as the first.

2. Subject v. Object (anaphoric form: noun):

The finding that the object was faster than the subject when the anaphoric form is the noun is supported by the results of an experiment performed by Yekovich et al (1979). These scholars were concerned with the linguistic processes that underlie the integration of two sentences. They proposed that the 'linguistic markings' of both the direct antecedent and its anaphor are important in comprehension. According to them, the antecedent (Concept) is ideally marked as focal (new) in the context sentence, whereas the ↑ (second-mention of the concept) is linguistically presupposed (old) in the target. To test this notion, they presented subjects with sentence pairs in which the 'linguistic markings' of a repeated noun phrase varied across the sentences. Context sentences incorporated the Concept as either presupposed (P) or focal (F). An example of the materials used by Yekovich et al is given below. The sentence pairs differed in the number of appropriate markings they contain: TWO refers to sets in which the occurrence of the repeated concept was marked appropriately in each sentence of the pair (FP). ONE represents those sets in which only ONE sentence of the pair appropriately marked the concept of interest (FF) and (PP). Finally, ZERO refers to those sets that had a repeated argument, though neither sentence marked the concept appropriately:

6. FP The lifeguard spotted the shark from a tower on the shore. TWO

FF On the shore, the lifeguard warned the diver about the current. ONE

PP From the distance, the shark noticed the movement in the water. ONE

PF In a cage beneath the boat, the diver photographed the eel. ZERO

TARGET The shark attacked the diver near the reef.

The approach adopted by Yekovich et al was to measure the time it took the subjects to understand the sentences. As Yekovich et al predicted, the subjects understood the TWOs faster than the ONEs and the ONEs faster than the ZEROs. In order to check the stability of their results, Yekovich et al asked another group of subjects to rate sentence pairs in terms of their cohesiveness. They defined cohesiveness as 'how easily and logically the second sentence follows from the first and expresses a continuous thought'. A sample of the sentence pairs used for this purpose is given below:

7. FP The poodle chased the clown around the ring.

The clown waved to the children at the circus.

PP The clown waved to the children at the circus.

The clown chased the poodle around the ring.

The subjects' ratings generally correspond to the comprehension time results. The only discrepancy with the comprehension time results is that the PP pairs (ONEs) were rated less cohesive than the PF texts (ZEROs).

The argument we want to present now is that the FP sentences in Yekovich et al experiment were understood faster (and rated as more cohesive) than the PP sentences not necessarily because in the FP sentences the repeated concept was marked appropriately in both sentences (in the sense of antecedent: New / Concept ↑ Second-mention of Concept :Given) whereas in the PP sentences only one sentence (context sentence) appropriately marked the concept of

interest but simply because in the FP sentences the noun is repeated to refer back to the object of the context sentence whereas in the PP sentences the noun is repeated to refer back to the subject of the context sentence. Our argument is based on the following points:

A. Yekovich et al seem to correlate subject status with givenness and object status with newness. We think that there is no necessary correlation of subject status with givenness or of object status with newness.

B. There is no reason why the concept conveyed by the subject of the context sentence should not also be considered as new. Both the concept conveyed by the subject and the concept conveyed by the object of the context sentence are newly introduced into the subject's consciousness (Chafe, 1976).

C. To explain why the PP sentence pairs (ONEs) were rated less cohesive than the PF texts (ZEROs), Yekovich et al argue that:

> This result may be due to awkwardness that becomes apparent when the PP sentences were scrutinized closely (as in a self-paced task). In natural language situations, the subject noun of an introductory sentence is often pronominalized when it is subsequently repeated. In the present experiment, however, the noun itself was repeated. This may have created some awkwardness in the PP condition, thereby lending to the low ratings of those sentence pairs. (p.545).

Thus, Yekovich et al themselves admit that it is awkward to repeat the noun to refer back to the subject. Note that they did not say it is awkward to repeat the noun to refer back to the object. If, as Yekovich et al admit, it is awkward to repeat the noun to refer back to the subject and if, as they seem to imply and as the results of our experiment showed, it is not awkward to repeat the noun to refer

back to the object, then this may be the reason why what Yekovich et al call the PP sentences (and what we would rather call the S+N sentences) were understood slower and rated less cohesive than what they call the FP sentences (and what we would rather call the O+N sentences).

In proposing ideas for further research, Yekovich et al write:

> Within the context of minimal connectedness, one fundamental issue for further consideration concerns the linguistic effects that operate when other types of information represent the antecedent and the anaphor. For example, do the comprehension effects produced by a repeated noun also occur with anaphoric pronouns and anaphoric definite descriptions? Presumemably, it is the linguistic markings rather than the exact type of repetition that guides integrative processes. (p.547).

If Yekovich et al are right, then this would mean:

A. There should be no difference between the time it will take the subjects to understand sentences like 8 and the time it will take them to understand sentences like 9. This is because, as Yekovich et al would argue, both types of sentences have the same 'linguistic markings':

8. Mike lost the match.

Mike became very miserable. PP (ONEs) / S+N

9. Mike lost the match.

He became very miserable. PP (ONEs) / S+P

As the results of our experiment showed, sentences like 9 were understood faster than sentences like 8.

B. Sentences like 10 should be understood faster than sentences like 11. This is because, as Yekovich et al would argue, sentences like 10 have the 'linguistic markings' FP (TWOs) whereas sentences like 11 have the 'linguistic markings' PP (ONEs):

10. Linda deceived Robert.

He became very angry. FP (TWOs) / O+P

11. Mike lost the match.

He became very miserable. PP (ONEs) / S+P

As the results of our experiment showed, there was no difference between the reaction time for sentences like 10 and sentences like 11.

To sum up, we say that it is the type of repetition (whether it is a pronoun or a noun) and the type of antecedent (whether it is subject or object) rather than the 'linguistic markings' that guide integrative processes.

5.11.3 Differences between native and non-native speakers:

The differences between the native speakers' and the non-native speakers' results are summarized below:

A. Summing S and O , the pronoun and the noun were alike for the native speakers whereas the noun was faster than the pronoun for the non-native speakers.

B. When the antecedent is subject, the pronoun was faster than the noun for the native speakers whereas the noun was faster than the pronoun for the non-native speakers.

C. For the native speakers the pronoun was faster than the noun when the antecedent is subject whereas the pronoun and the noun were alike when the antecedent is object. For the non-native speakers, on the other hand, the noun was faster than the pronoun for the subject and the object.

Note that the non-native speakers' results are similar to those of Richek's experiment. These results suggest that the non-native speakers' understanding of the function of anaphoric pronouns is incompletely developed. Possibly, Richek's observation that 'the less information an anaphoric form contains, the more difficult it would be to comprehend' may apply not only to school-age native speakers but also to non-native speakers. Moreover, in spoken language the non-native speakers may find it more difficult to recognise the pronoun since it is normally unstressed. Simukoko (forthcoming) has constructed a number of sentence pairs in order to elicit some inter-language characteristics of Zambian learners of English. In the second sentence of each of these pairs, the noun was repeated (rather than pronominalized) to refer back to the subject of the first sentence. When asked why the repetition of the noun and not the pronoun, Simukoko (an experienced teacher) replied that the repetition of the noun would make it easier for the learners to understand the sentences.

NOTES

1. The fact that a significant negative correlation was obtained between length of sentences in words and reaction time is interesting not only in that it suggests that the subjects could anticipate the content of sentences but also in that it provides evidence to suggest that the length variable [in words] was confounded with the anaphoric form variable. In many sentences used in this experiment, the noun was one word longer than its pronoun counterpart. If, as the correlation results showed, listening time decreases with the increase in the number of words in the sentence, and if many noun sentences used in this experiment are one word longer than their pronoun counterparts, then the implication is that the obtained differences between the pronoun and the noun may have been significantly affected by the difference in length [in words] between the two anaphoric forms. As a result, the differences obtained between the pronoun and the noun should be viewed with some caution. Note also that although the negative correlation between the length of sentences in time and reaction time was not significant, it is large enough to suggest that the variable of length [in time] may also have been confounded with the anaphoric form variable. This problem of length was only identified after the first experiment was performed. In the second experiment, an attempt was made to solve this problem. However, and for reasons given in chapter 6, this attempt was apparently unsuccessful especially in the case of differences in length in time. Thus, although the negative correlation between length in time and reaction time was not significant, it is nevertheless large enough to indicate that length in time may also have been confounded with the anaphoric form variable. In the third experiment, our attempt at solving this problem was apparently more successful than in the previous experiment.

Thus, although a negative correlation was also obtained, the values of the r were sufficiently small to suggest that our attempt at solving the problem was more successful than in Experiment 2.

2. Animacy is probably the most important component of what James refers to as image-value. Hence, we concentrate on contrasting animate with inanimate nouns.

CHAPTER SIX

EXPERIMENT TWO

6.1 AIMS OF THE EXPERIMENT:

In Chapter three, we made a distinction between two types of Current Subject referents:

A: Current Subject referents which are not uniquely identified by the expression [CS nu] as in 1 below:

1. John hit Mary.

a. He/b. John was drunk.

The referent 'John' in 1 is not uniquely identified by the expression John. Any individual who is called "John" is picked out by the expression John.

B: Current Subject referents which are uniquely identified by the expression [CS u] as in 2 below:

2. The Queen Mother celebrated her 80th birthday in August. a. She/ b. The Queen Mother received hundreds of cards from well-wishers.

The referent 'The Queen Mother', unlike 'John' in 1, is uniquely identified (in the current British context) by the expression The Queen Mother.

The results of the first experiment (native speakers) showed that the pronoun was faster than the noun when the referent is (CS nu]. One of the explanations offered for these results is that when the pronoun is used (as in 1a above), the listener will have no doubt that the same referent is being talked about whereas when the noun is repeated (as in 1b above), he will not be able to know whether the referent of the second noun is the same or different from that of the first noun.

This experiment was designed to test this explanation. All the subject referents in the sentences used in this experiment are of the type [CSu]. If this explanation is to be supported, then there should be no difference between the pronoun and the noun when the referent is [CSu]. This is because the argument made by this explanation against noun repetition does not apply in the case of [CSu] referents. When the referent is [CSu], both the pronoun and the noun explicitly signal to the listener that the same referent is being talked about. Thus, for example, in 2 above the listener will have no doubt that both she and the second The Queen Mother refer to the same individual as the first, The Queen Mother.

6.2. MATERIALS:

Sixteen simple active sentences were constructed. The subject referent in each of these sentences is uniquely identified by the referring expression. A pair of simple active target sentences was constructed for each of the 16 context sentences. Each of these sentence pairs make a reference back to the subject of the context sentence. The target sentences in each pair differ only in whether the reference is made by the pronominal form of the antecedent noun phrase or by the repetition of that noun phrase. As in the first experiment, the sequence context sentence plus target sentence is followed by a question. Half the questions require a 'yes' answer and the other half require a 'no' answer. The sentence 'NEXT TRIAL' introduces all the experimental trials with the exception of the first and the last trials. The former is introduced by the sentence 'FIRST TRIAL' and the latter by the sentence 'LAST TRIAL'. Below is an example of the materials used in the experiment:

3. Mrs. Thatcher became Prime Minister in May last year.

She/Mrs. Thatcher won the general election with an overall majority of 43 seats.

From these materials the following pair of treatments were identified:

[CSu] + P v. [CSu] + N

The following points should be noted about the choice of the expressions used in this experiment:

1. Where possible, a one-word version of the expression was used in preference to a more-than-one-word version. This was done so that the noun and the pronoun target sentences would have the same length in words (see previous chapter). Thus, the expressions in the second column were used in preference to those in the first column:

1.	William Shakespeare	Shakespeare
2.	Idi Amin	Amin
3.	The Ayatollah Khomeini	Khomeini
4.	Adolf Hitler	Hitler
5.	Winston Churchill	Churchill

Note that the use of expressions 2 and 3 in the second column in preference to the use of their longer counterparts in the first column was not without its problems:

A. Amin, unlike Idi Amin, may be understood to refer to either 'the former President of Uganda' or to 'the present President of Afghanistan'. This is specially the case since the latter referent was more on the news than the former at the time at which the experiment was being administered.

To make it clear to the subjects that Amin is used to refer to 'Idi Amin', the context sentence reads:

Amin fled from Uganda 18 months ago.

B. Possibly, the subjects are more likely to recognize the referent 'Khomeini' if The Ayatollah Khomeini rather than Khomeini is used. To increase the chances of the referent being recognised, the context sentence reads:

Khomeini returned to Iran in February, 1979.

Note also that the use of either Winston Churchill or Churchill may be understood to refer to either 'the former Prime Minister' or to 'the present MP'. To make it clear to the subjects who is the intended referent of Churchill the context sentence reads:

Churchill led Britain to victory in the second war.

2. If the problem of the difference in length between the pronoun and the noun sentences were to be completely eliminated, then all the antecedent noun phrases used in the experiment should have consisted of one word. There are two reasons why it was not possible for us to achieve this:

A. Many of the referents which are likely to be recognised by our subjects are referred to by noun phrases which consist of more than one word. For these referents, the whole expression must be used, if the referent is to be uniquely identified by the expression. Thus, for example, the referent 'The Queen Mother' is referred to by the expression The Queen Mother. Obviously, if the subjects are to recognise this referent, then the whole expression The Queen Mother must be used.

B. Many of the referents which are most likely to be recognizable to our subjects have a title (e.g. Mr. Mrs. President etc.). Referring to these referents by their names without their titles may convey to the listener not only the referents but also the speaker's attitude towards these referents. Thus, for example, the use of Thatcher (rather than Mrs. Thatcher) may convey not only the referent 'Mrs. Thatcher' but also the speaker's negative attitude towards 'Mrs. Thatcher'. The author of this thesis once saw on television a person who was demonstrating against the policies of 'Mrs. Thatcher' carrying a banner written on it THATCHER OUT. It seems to me that the use of Thatcher by this demonstrator was not only meant to convey 'Mrs. Thatcher' but also the demonstrator's negative attitude towards (the policies of) 'Mrs. Thatcher'. To give another example, the author of this thesis once heard on television former American President 'Ford' referring to the then 'President Carter' by the expression Carter. The occasion was that 'Ford' was giving advice to the then presidential candidate 'Ronald Reagan' on how to go about debating his rival for the presidency. It is worth remembering that 'Mr. Carter' defeated 'Mr. Ford' in the 1976 presidental election. It is of interest to observe that by using Carter rather than President Carter to refer to the then 'President Carter', the speaker was not only communicating his negative attitude towards the referent but also signalling to his addresser (Reagan) that "my opinion about 'Carter' is the same as that of yours" (ie we share the same point of view).

Since this experiment was not designed in order to test the listener's reaction to the speaker's attitude towards the referents, it would be inappropriate to refer to these referents by their names without their titles.

To sum up, an attempt was made to eliminate differences in length between pronoun and noun sentences. However, because of the reasons given in 2 above, it was not possible for us to completely eliminate this problem. Not all of the expressions could be shortened to one word. If this was done then:

a. The referent will no longer be uniquely identified by the expression.

b. The referent as well as the speaker's attitude towards the referent may be conveyed.

For the purposes of the experiment, it is more important to avoid these problems than to completely eliminate the difference in length between the target sentences.

6.3. MAKING THE DATA TAPES:

The experimental tapes were made in the same way as in the first experiment. The informant who recorded the sentences for the first experiment also recorded the sentences for this experiment. The tones were recorded in the same way as in the first experiment. The only difference is that whereas in the first experiment each of the three tests (PRACTICE TEST, TEST 1, TEST 2) was recorded on a separate tape (three tapes in all), in this experiment the PRACTICE TEST plus each

of the two EXPERIMENTAL TESTS were recorded on one tape (ie - Tape 1: PRACTICE TEST + TEST 1, Tape 2: PRACTICE TEST + TEST 2). This was done in order to make the administration of the experiment much easier. Thus, instead of placing the tape on the tape recorder twice for each subject (as it would have been the case if the PRACTICE TEST and the EXPERIMENTAL TEST were recorded on separate tapes), the tape was set on the tape recorder only once for each subject [PRACTICE TEST + EXPERIMENTAL TEST (either TEST 1 or 2)].

Note that, however, putting the PRACTICE TEST and the EXPERIMENTAL TEST on one tape was not without its problem. It was important that the subject would not proceed to the EXPERIMENTAL TEST before the experimenter could enter the computer programme neeeded to record the data. If the subject proceeded to the EXPERIMENTAL TEST before the computer programme was entered, then he would hear some of the sentences without the data being recorded. To reduce the chances of this happening, the following steps were taken:

A. It was stressed to the subject that he should not start doing the EXPERIMENTAL TEST unless he was given the signal to do so (after the experimenter cleared the computer programme which recorded the data for the PRACTICE TEST and entered the computer programme for the EXPERIMENTAL TEST).

B. The sentence 'END OF PRACTICE TEST' which was inserted between the last tone in the PRACTICE TEST (the tone which will stop the tape recorder after the last question in the PRACTICE TEST is heard) and the tone preceeding the first two sentences in the EXPERIMENTAL TEST (ie- 'EXPERIMENTAL TEST ----- FIRST TRIAL').

The latter tone will stop the tape recorder (after the sentence 'END OF PRACTICE TEST' is heard) in a position ready for the start of the EXPERIMENTAL TEST. The purpose of the sentence 'END OF PRACTICE TEST' was to remind the subject that he had just finished the PRACTICE TEST and that he should not proceed to the EXPERIMENTAL TEST unless he was told to do so.

The tapes used in this experiment accompany the thesis.

6.4 SUBJECTS

Twenty native speakers of English took part in the experiment. All the subjects were undergraduate students at Edinburgh University. Each subject received 50p for his participation. The non-native speakers were not used in this experiment because there was no point in doing so. As the results of the first experiment showed, the non-native speakers understood the noun sentences faster than the pronoun sentences regardless of whether the referent is (CS] or [CO] (both types of referents are [Cnu]).

6.5 DESIGN

The experimental trials were divided into 2 tests, TEST 1 and TEST 2. Each test consisted of 8 [CSu] + P and 8 [CSu] + N trials. If a sentence pair contained a [CSu] + P in TEST 1, it would contain the [CSu] + N in TEST 2 and if a sentence pair containd a [CSu] + P in TEST 2, it would contain the [CSu] + N in TEST 1. The order in which the trials were presented in TEST 1 was random. The position of each trial in TEST 2 was the same as that of its counterpart in TEST 1.

The subjects were randomly divided into two groups (each consisting of 10 subjects). One group was presented with TEST 1 and the other group with TEST 2. Thus, the subjects in this experiment, unlike those in the first experiment, were not presented with the same pronoun and noun sentences (e.g. He/Hitler committed suicide in 1945). Rather, half of the subjects were presented with different pronoun and noun sentences and the other half were presented with the counterparts of these sentences.

6.6. EQUIPMENT

The equipment used in this experiment was basically the same as that used in the first experiment. There were, however, some modifications, additions and omissions. These are discussed below.

1. In the first experiment, there were four buttons on the top of the Control Box (START, NEXT, YES and NO). In this experiment, the START button was removed from the Control Box and put in the computer room so that it will be under the control of the experimenter. This meant that each test would be started by the experimenter and not by the subject. The START button was removed from the control box because it was felt it would be much easier for the subject to understand the instructions. Thus, the subject was left with only three buttons to deal with (NEXT YES and NO). In the first experiment, the subject first had to press the START button to hear, for example, TEST 1 ---- FIRST TRIAL before he could press the NEXT button for the first sentence. Some of the subjects used in that experiment thought that the START button had to be used before each trial.

2. In this experiment, unlike the first experiment, the Mingograph was not used in the actual running of the experiment. There were two reasons why the Mingograph was not used in the running of this experiment.

A. In the first experiment, the equipment was not working perfectly. As has been mentioned in the previous chapter, the tape recorder would sometimes fail to start when the subject pressed the button. Consequently the subject had to press the button once more before the tape recorder would start. Extra button pushes in a particular trial made it difficult for us to know which time belongs to which sentence. The mingograph was used in the first experiment to overcome this problem. In the present experiment the equipment was working perfectly well. As a result, the chances of a subject pressing extra buttons in a particular trial were greatly reduced. As it turned out, there were only three instances (out of the total 320) in which the subjects pressed an extra button. These three extra button pushes were accidently made by the subjects.

B. The use of the Mingograph in the first experiment meant that at least three people were needed to administer the experiment. One person was needed to attend to the subject and the computer programme, another person to attend to the tape recorder and a third person to attend to the mingograph.

It was felt that it would be much easier to administer the experiment if the Mingograph could be dispensed with. Thus, in the present experiment only two people were needed to run the experiment. Moreover, the preparations needed to start the test for each subject were much easier and took less time.

3. A microphone was connected from the tape recorder to the computer room (where the experimenter will be monitoring the progress of the experiment). The function of this microphone was to enable the experimenter to listen to the sentences while they were being processed by the subject. In addition to listening to the sentences, the experimenter was able to monitor the progress of the experiment by looking at the computer screen where the data was being recorded while at the same time holding a sheet of paper which contained the experimental trials. The purpose of this monitoring process was to look for and locate any extra button pushes made by the subject.

4. In the first experiment, the computer was programmed to recognise the end of each trial and the beginning of the next after every four button pushes. This meant that if the subject made, say, an extra NEXT button push in trial 19, then the last button push in this trial (the button push made by the subject to answer the question) would be regarded by the computer as the first button push in trial 20.

Once this happened and provided that no more extra button pushes were made, then the last button push in trial 20 would be regarded by the computer as the first button push in trial 21 and so on. In the end, the last button push in the last trial (trial 24) would be regarded by the computer as the first button push in a trial which did not exist in the experiment (25). To illustrate, consider the example given below which was taken from the data in experiment 1 (subject 10):

Trial Number	No. of responses	Button pushes	Reaction time
19	1	2	201
19	2	2	212
19	3	2 (next)	524
19	4	2	337
20	1	8 (no)	407
.	.	.	.
.	.	.	.
24	1	8 (no)	381
24	2	2	212
24	3	2 (next)	384
24	4	2	255
25	1	4 (yes)	464

The subject made an extra NEXT button push in trial 19. The computer recognized the end of trial 19 after the fourth response (opposite the fourth 19 in the first column) was made. This is despite the fact that the subject had yet to answer the question in trial 19. When the subject pressed the button to answer the question in trial 19, this button push was regarded by the computer as the first button push in trial 20. Because of this, the button push made by the subject to answer the question about trial 20 was regarded by the Computer as the first button push in trial 21 and so on. Note that this example illustrates the problem in its simplest form (when the subject pressed one extra button in one trial). When the subject pressed an extra button in more than one trial, it became very difficult to know where each trial ended and where the next one began.

Because in the present experiment the computer was our only source of data and because the use of the computer programme used in the first experiment would have made it difficult for us to recognize where each trial ended and where the next one began when the subject made extra button pushes, the computer programme used in the first experiment was modified so that the computer would only recognize the end of a trial and the beginnning of the next if the following two conditions were satisifed:

A. The subject pressed the button to answer the question in the current trial.

B. The subject heard the sentence 'NEXT TRIAL' (after he had answered the question).

Thus, even if the subject made, say, 4 extra button pushes in a particular trial, the computer would not recognize the end of that trial and the beginning of the next unless the two conditions given above were satisfied.

As a result:

A. We had no problem in recognizing the boundaries between the trials.

B. When the subject pressed more buttons than required in a particular trial, the problem of identifying these extra button pushes was confined to the trial (s) concerned and did not extend to the other trials in which the correct number of buttons were pressed (as it would have been the case if the programme used in the first experiment was also used in this experiment).

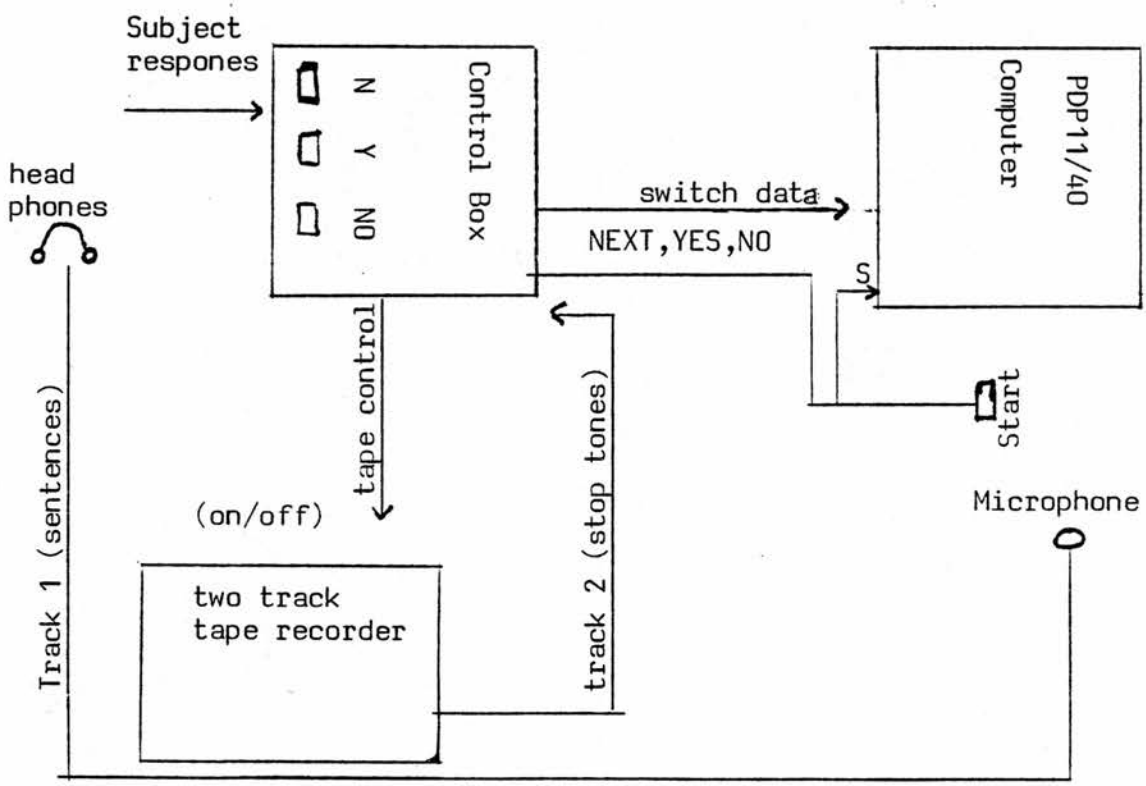
To illustrate the difference between the programme used in the first experiment and that used in the present experiment, consider the example given below which was taken from the data in experiment 2 (subject 12) and compare it with the example given to illustrate the problem of the computer programme used in the first experiment:

Trial Number	No. of responses	Button pushes	Reaction time
4	1	2	137
4	2	2	89
4	3	2	512
4	4	2	355
4	5	8	439
5	1	2	287
5	2	2	494
5	3	2	600
5	4	4	676
.	.	.	.
.	.	.	.
16	1	2	333
16	2	2	488
16	3	2	367
16	4	8	432

As subject 10 in the first experiment, subject 12 in the second experiment also made an extra button push (tiral 4). Nevertheless, the programme used in the present experiment, unlike that used in the previous experiment, did not recognize the end of trial 4 after the fourth response was made. Rather, the end of this trial was recognized after the subject answered the question in this trial. Note that the trial number opposite the response to the question was still 4 and not 5 as it would have been the case if the programme used in this experiment was the same as that used in the previous experiment. Note also that the extra button push in trial 4 did not create any problems in the following trials.

Figure 6.6.1 below shows the equipment as used in this experiment.

Figure 6.6.1: Equipment and procedure (experiment 2)



6.7 PROCEDURE:

1. The experiment was administered in three different rooms. Each room contained one of the three main pieces of equipment (control box, tape recorder, computer). The computer room also contained the START button (which was connected from the control box) and the microphone (which was connected from the tape recorder). The control box was connected to both the tape recorder and the computer (see figure 6.6.1)
2. The equipment was set ready for the start of the experiment before the subject arrived. The experimenter entered the computer programme for the PRACTICE TEST and the experimenter's assistant placed the tape on the tape recorder in a position ready for the PRACTICE TEST.
3. When the subject arrived, he was taken to the room which contained the control box. The subject was told that he would first do a practice test before he would do the actual test. The purpose of the PRACTICE TEST was to make sure that the subject understood the experimental procedure. The subject was told to start the PRACTICE TEST when he heard the sentence 'PRACTICE TEST' followed by the sentence 'FIRST TRIAL'. After hearing the sentence 'FIRST TRIAL', the subject was instructed to press the NEXT button for the first sentence, to press it again for the second sentence and finally to press it for the third time for the question. The subject was instructed to answer the question by pressing either the YES or the NO button. It was made clear to the subject that he should press the NEXT button to request the following sentence as soon as he felt he had understood the current sentence. The subject was also explicitly instructed not to touch any of the buttons after finishing the PRACTICE TEST.

He was told he could only start the actual test when he was given the signal to do so. The subject was given a pair of headphones and was instructed how to adjust these to fit his hearing ability.

4. After giving the instructions to the subject, the experimenter went to the computer room and immediately pressed the START button. When this button was pressed, the subject heard the introduction to the PRACTICE TEST and started doing the test.

5. As soon as the subject finished the practice test, the experimenter rushed to the subject in order to make sure that he would not immediately proceed to the actual test. The experimenter made a final check on the subject's understanding of the instructions. Nearly all the subjects had no difficulty in understanding these instructions. The subject was told to start the EXPERIMENTAL TEST only when he heard the sentence 'EXPERIMENTAL TEST' followed by the sentence 'FIRST TRIAL'. He was told that the sentences in the test contained information which is factually true. He was, therefore, instructed not to question the truth value of the information conveyed by the sentences. This was important since we did not want the subject to spend time questioning the truth value of the information conveyed by the sentences. Thus, for example, on hearing the sentence 'Shakespeare left £10 for the poor of Stratford' we did not want the subject to spend time wondering whether this is true or not.

6. After making sure that the subject understood the instructions, the experimenter went back to the computer room and cleared the computer programme which recorded the data for the practice test before he entered the programme needed to record the data for the actual test. As soon as that was done, the experimenter pressed the START button.

After hearing the introduction to the test, the subject went through the EXPERIMENTAL TEST in the same way as he went through the PRACTICE TEST. While the subject was doing the test, the experimenter stayed in the computer room in order to monitor the progress of the experiment in the way described in section 6.6:3.

7. The subjects were tested individually. After finishing the EXPERIMENTAL TEST, each of the subjects was asked whether he recognised all the persons mentioned in the test. The success of the experiment depends on all the subjects recognizing all the critical referents mentioned in the test. Fortunately, all the subjects said that they had recognized all the critical referents mentioned in the test while they were processing the sentence.

6.8 OBTAINING LISTENING TIME FOR EACH SENTENCE

Since in this experiment there was no independent Mingograph record of what each subject did during the experiment, the following formula was used to botain the listening time for each sentence:

$S = Z - (X + Y)$

S: Listening time = time from the end of the sentence to the next button push.

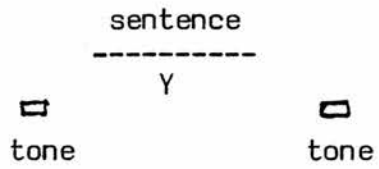
Z: Time given by the computer = time from a button push to the next button push.

X: Time from when the subject presses a button requesting a sentence to when the sentence actually begins.

Y: Length of sentence in time = time from beginning to end of sentence.

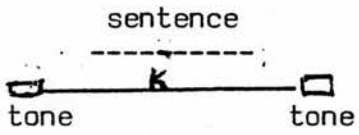
The calculation of the listening time for each sentence required three steps:

1. The first step was to calculate time Y for each sentence (length of each sentence in time). In order to obtain this time, the test tapes were run on the mingograph. From this record provided by the mingograph we measured the length of each sentence in time by using a ruler (one milimeter = one centisecond):

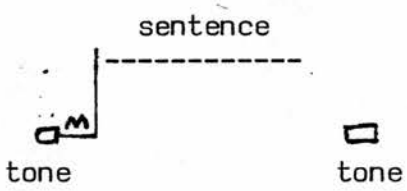


2. The second step was to calculate time X for each sentence (time from when the subject presses the button to request the sentence to when the sentence actually begins). In order to calculate this time, the following times had to be obtained:

a. Time between the tone preceding the sentence and the tone following the sentence. Let us refer to this time as time K:



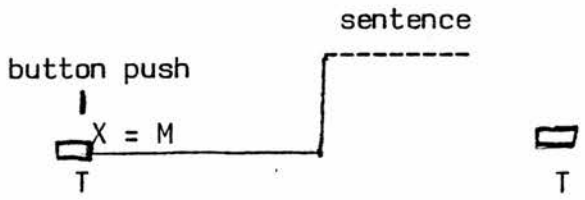
b. Time between the tone preceding the sentence and the beginning of the sentence. Let us refer to this time as time M:



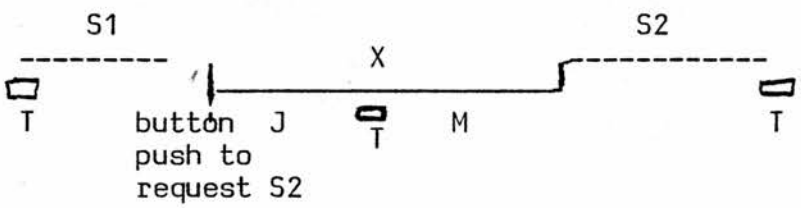
Times K and M were calculated in the same way as time Y (ie - from the mingograph record).

Time X for a sentence, unlike time Y for that sentence, was not a constant. Time X for a sentence (the time from when the subject presses a button requesting the sentence to when the sentence acutally begins) could either be equal to time M (time between the tone preceding the sentence and when the sentence actually begins) or it could be more than time M for that sentence. In other words, If the button push made by the subject to request the sentence comes at the same place as the

tone preceding the sentence, then time X for that sentence will be equal to time M for that sentence:



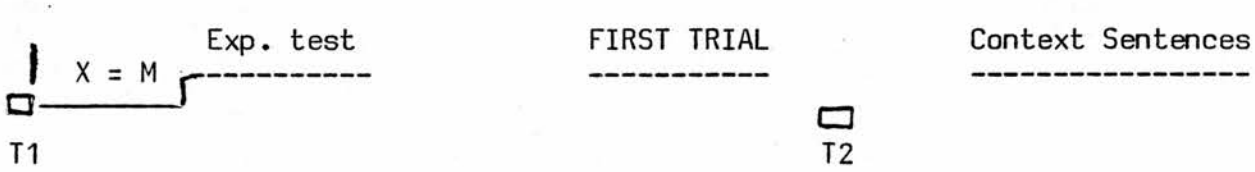
In this case there is no problem in calculating time X since time M (which equals time X) is readily available from the mingograph record. On the other hand, if the button push made by the subject to request the sentence comes before the tone preceding the sentence, then, first, the tape recorder will not stop between the requested sentence and the sentence preceding it and, secondly and most importantly, the time which will pass before the requested sentence actually begins (time X) will not be equal only to time M for that sentence (time between the tone preceding the sentence and the beginning of the sentence) but equal to time M plus the time between the button push made by the subject and the tone preceding the sentence. If we refer to this latter time as time J, then time X in this latter case will be equal to time M + time J:



If time X = M + J, then we will need to calculate J before adding it to M to provide us with X. Below we will illustrate, first, the case in which the button push made by the subject to request the sentence comes at the same place as the tone preceding the sentence (X = M) and secondly, the case in which the button push made by the subject to request the sentence comes before the tone preceding the sentcnec (X = M + J).

A. Button push comes at the same place as the tone preceding the sentence (X = M):

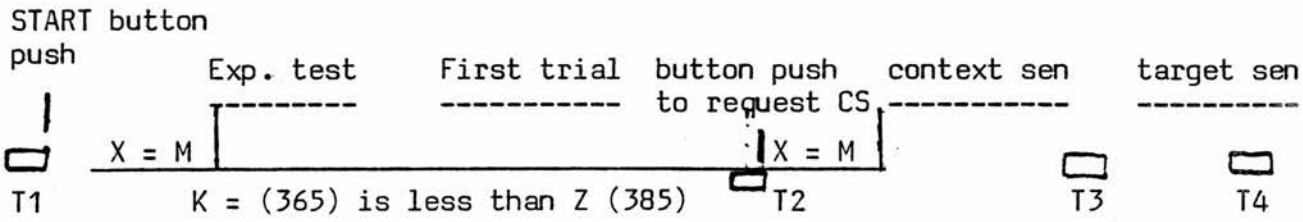
To illustrate thiscase, let us start by considering the first two introductory sentences in the EXPERIMENTAL TEST (ie EXPERIMENTAL TEST ..... FIRST TRIAL). When the experimenter pushes the START button to start the EXPERIMENTAL TEST, this button push will always come at the same place as the first tone in the test (the tone preceding the two introductory sentences). In this case, the time which will pass before the sentence 'EXPERIMENTAL TEST' begins (X) will always be equal to the time between the tone preceding the sentence and the beginning of the sentence (M):



If we now want to find out whether time X for the following context sentence is equal to time M for that sentence or whether it is equal to time M plus time J for that sentence, then we should compare time Z for the two introductory preceding sentences (time from when the experimenter presses the START button to start the test to when the subject presses the button to request the context sentence) to time K for the two introductory sentences (time from tone 1 to tone 2 (see the figure above).

If time Z for the two introductory sentences is equal to or more than time K for these two sentences, then time X for the context sentence will be equal to time M for that sentence. The argument runs as follows. The time it will take the tape recorder to stop between the two introductory sentences and the following context sentence equals time K for the two introductory sentences (the function of tone 2 is to stop the tape recorder after the two introductory sentences).

If time Z for the two introductory sentences (time from when the experimenter pushes the START button to when the subject pushes the first NEXT button for the context sentence) is more or equal to time K for the two introductory sentences (the time it will take the tape recorder to stop after the two introductory sentences), then this will mean that the tape recorder has been stopped (by tone 2) while the subject is still processing the two introductory sentences. When the subject finishes processing the two introductory sentences (sometime after the tape recorder has stopped), he will push the NEXT button to request the context sentence. Since the tape recorder has already been stopped (by tone 2), this button push made by the subject to request the context sentence will come at the same place as tone 2. Consequently, the time which will pass before the requested context sentence begins (time X) will be equal to the time between the tone preceding the context sentence (tone 2) and the beginning of that sentence (time M). To illustrate, suppose that time K for the two introductory sentences was 365 centiseconds. Furthermore, suppose that for a particular subject time Z for the two introductory sentences was 385. Since time Z for the two introductory sentences (385) is more than time K for these two sentences (365), then this would mean that the tape recorder had stopped before it started once more (from the same place as tone 2) when the subject pushed the button to request the context sentence. Consequently, the time which passed before that subject actually heard the beginning of the sentence (time X) would be equal to the time from tone 2 to the beginning of the sentence (M):



If we assume that time M for the context sentence (as obtained from the mingograph record) is 60 centiseconds, then time X for that sentence will also be equal to 60 centiseconds.

B. Button push made by the subject to request the sentence comes before the tone preceding the sentence (X = M + J):

If, on the other hand, time Z for the two introductory sentences is less than time K for these two sentences, then this would mean that the subject pressed the button to request the context sentence before the tone which is supposed to stop the tape recorder (tone 2) between the two introductory sentences and the context sentence. In this case (when the subject pressed the button before tone 2), the tape recorder would not stop between the two introductory sentences and the context sentence. Moreover, the time which will pass before the subject actually hears the beginning of the context sentence (time X) will not be equal to time M only (time from tone 2 to the beginning of the context sentence) but equal to time M plus time J (time from the button push made by the subject to the tone preceding the context sentence).

To illustrate this case, suppose that for another subject time Z for the two introductory sentences was 340 centiseconds. Since time Z for the two introductory sentences in this case (340) is less than time K for the two sentences (365), then this would mean that the button push made by this subject to request the context sentence came before tone 2.

This is turn meant that:

a. The tape recorder did not stop between the two introductory sentences.

b. The time which passed before the subject actually heard the beginning of the context sentence (X) equals time M plus time J for that sentence. In such cases, we first had to calculate time J (time from the button push made by the subject to request the sentence to the tone preceding the sentence) before adding it to time M to provide us with time X. Time J was calculated by the following formula.

J (for current sentence) = K - Z (for previous sentence)

In the example given above:

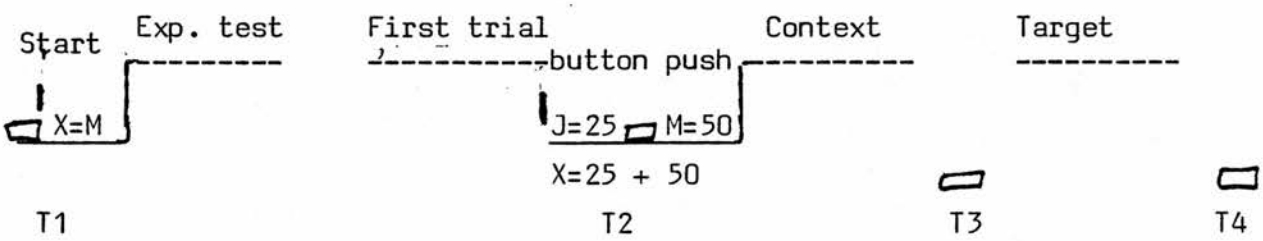
J (for context sentence) = K - Z (for the two introductory sentence)

= 365 - 340 = 25

X (for the context sentence) = M + J (for the context sentence)

If we assume that M for the context sentence in this example equals 50 centiseconds, then X for this sentence =

50 + 25 = 75 centiseconds:



Suppose now we want to find out (for the same subject in the example above) whether time X for the target sentence equals time M for that sentence or whether it equals time M + time J for that sentence. In this case, we should not only compare time Z for the context sentence to time K for that sentence in order to find out whether time X for the target sentence equals time M for that sentence or whether it equals time M + time J for that sentence.

Rather, we should compare time Z for the context sentence to time K + time J for that sentence. This is because, in this case the time it will take the tape recorder to stop after the context sentence is not only equal to time K for that sentence but equal to time K + time J for that sentence (see the above figure). If time Z for the context sentence is equal to or more than time K + time J for that sentence, then time X for the target sentence would be equal to time M for that sentence. If, on the other hand, time Z for the context sentence is less than time K + time J for that sentence, then time X for the target sentence would be equal to time M + time J for that sentence. In this latter case, time J for the current sentence is obtained by the following formula:

J (current sentence) = (K + J) - Z (for preceding sentence)

Suppose that time K for the context sentence in the example given above (time from tone 2 to tone 3) equals 350 centiseconds. Furthermore, suppose that time Z for that same sentence equals 360 centiseconds. Since time Z for the context sentence (360) is less than time K + time J for that sentence (350 + 25), time X for the target sentence would be equal to time M + time J for that sentence. Time J for the target sentence equals (350 + 25) - 360 = 375 - 360 = 15. If we assume that time M for the target equals 45 centiseconds, then time X for the target would be equal to 45 + 15 = 60 centiseconds.

In summary, if we want to find out whether time X for the current sentence is equal to time M for that sentence or whether it is equal to time M + time J for that sentence, then we should first check whether time X for the previous sentence is equal to time M for that sentence or whether it is equal to time M + time J for that sentence.

This check could only be achieved if we start from the first two introductory sentences in the test and from there proceed to the remaining sentences. If time X for the previous sentence equals time M for that sentence, then we should compare time Z for that sentence to time K for the same sentence. If time Z for the previous sentence is equal to or more than time K for that sentence, then time X for the current sentence would be equal to time M for that sentence. If time Z for the previous sentence is less than time K for that sentence, then time X for the current sentence would be equal to time M + time J for that sentence. In this case, time J for the current sentence would be equal to K for the previous sentence minus time Z for that sentence.

If, on the other hand, time X for the previous sentence equals time M + time J for that sentence, then we should compare time Z for that sentence to time K + time J for the same sentence. If time Z for the previous sentence is equal to or more than time K + time J for that sentence, then time X for the current sentence would be equal to time M for that sentence. If time Z for the previous sentence is less than time K + time J for that sentence, then time X for the current sentence would be equal to time M + time J for that sentence. In this case, time J for the current sentence equals time K plus time J for the previous sentence minus time Z for that same sentence.

3. Having calculated time Y and time X for each sentence (whether it equals time M or time M + time J), the final step was to add these two times and subtract the total from time Z for the sentence (time from the button push made by the subject to request the sentence to the button push made by the subject to signal that the sentence has been understood). The resulting time would be the listening time for the sentence (time from end of sentence to NEXT button push).

To illustrate how listening time (S time) was calculated for each sentence, consider the hypothetical example given below (a hypothetical example is given because we want to illustrate all the cases discussed above):

Sen	Time Z	Time K	Time Y	Time M	Time J	Time X	Time S
B	599	528	399	100	0	100	100
C	610	626	450	95	0	95	65
D	495	423 + 16	313	65	16	81	101
E	612	629	500	85	0	85	27
F	456	455 + 17	399	25	17	42	15

Below we will demonstrate how listening time (time S) for each of the sentences given in the first column is obtained:

1. S (B): Listening time for sentence B:

For convenience, let us assume that time X for the preceding sentence (sentence A) equals time M (A). Furthermore, let us assume that Z (A) is more than K (A). This would mean that X (B) = M (B). If M (B) = 100 centiseconds, then X (B) also = 100 centiseconds.

S (B) = Z (B) - (Y (B) + X (B))

= 599 - (399 + 100)

= 599 - 499 = 100 centiseconds

==========

2. S (C):

To find out whether X (C) = M (C) or whether X (C) = M (C) + J (C), we should compare Z (B) to K (B).

Since Z (B) is more than K (B), X (C) = M (C). If M (C) = 95 then X (C) also = 95.

S (C) = Z (C) -(Y (C) + X (C))

= 610 - (450 + 95)

= 610 - 545 = 65 centiseconds
==========

3. S (D):

To find out whether X (D) = M (D) or whether it equals M (D) + J (D), we should compare Z (C) to K (C).

Since Z (C) is less than K (C), X (D) = M (D) + J (D).

J (D) = K (C) - Z (C)

= 626 - 610 = 16 centiseconds
==

X (D) = M (D) + J (D)

= 65 + 16 = 81
==

S (D) = Z (D) - (Y (D) + X (D))

= 495 - (313 + 81)

= 495 - 394 = 101 centiseconds
===

4. S (E):

To find out whether X (E) = M (E) or whether X (E) = M (E) + J (E), we should compare Z (D) to K (D) + J (D). Z (D) = 495 and K (D) + J (D) = 439.

Since Z (D) is more than K (D) + J (D), X (E) = M (E). If M (E) = 85, then X (E) also = 85.

S (E) = Z (E) - (Y (E) + X (E))

= 612 - (500 + 85)

= 612 - 585 = 27 centiseconds
==========

5. S (F):

To find out whether X (F) = M (F) or whether X (F) = M (F) + J (F), we should compare Z (E) to K (E). Since Z (E) is less than K (E), X (F) = M (F) + J (F).

J (F) = K (E) - Z (E)

= 629 - 612 = 17

==

X (F) = M (F) + J (F)

= 25 + 17 = 42

S (F) = Z (F) - (Y (F) + X (F))

= 456 - (399 + 42)

= 456 - 441 = 15

==

If we now want to find out whether time X for the following sentence (sentence G) is equal to time M for that sentence or whether it is equal to time M + time J for that sentence, then we should compare Z (F) to K (F) + J (F). Z (F) = 456 and K (F) + J (F) = 472.

Since Z (F) is less than K (F) + J (F), X (G) = M (G) + J (G).

J (G) = (K (F) + J (F)) - Z (F)

= (455 + 17) - 456

= 472 - 456 = 16

==

Having obtained J (G), we should then add it to M (G) to provide us with X (G). To obtain S (G), we should then add Y (G) to X (G) and subtract the total from Z (G).

6.9 RESULTS

The subjects' mean times for the pronoun and the noun are given in table 6.9.1 below:

Table 6.9.1: The subjects' mean times for the pronoun and the noun

P	N
107.6	114.7

The subjects understood the pronoun sentences an average of 7.1 centiseconds faster than the noun sentences.

This effect was reliable by subjects but unreliable by sentences and min F':

$F1\ (1,19) = 4.45,\ P < .05$

$F2\ (1,15) = 1,\ P > .05$

$\min F'\ (1,22) < 1$

(For the summary of the analysis of variance by subjects see Appendix 2, section 2.2, sub-section 2.2.1: C. For the summary of the analysis of variance by sentences see Appendix 2, section 2.2, sub-section 2.2.2: C).

As in the first experiment, we also analysed the context sentences in order to find out whether there is any correlation between the length of these sentences (in words and time) and their reaction times. This analysis showed no reliable correlation between either the length of sentences in words and reaction time [$r = -.14$, $P > .05$ (with 14 df)] or the length of sentences in time and reaction time [$r = -.37$, $P > .05$ (with 14df)]. For the length of the context sentences in words and time and the reaction time of these sentences see Appendix 2, section 2.3.

However, there seems to be a relationship between the reaction time of the context sentences and the difference between the pronoun and the noun target sentences. In 5 of the 16 context - target pairs used in the experiment (1,4,9,12,14) the noun was faster than the pronoun.

In the remaining 11 context-target pairs the pronoun was faster than the noun (for the context-target pairs used in the experiment see Appendix 2, section 2.1. For the totals of the two experimental treatments by sentences see Appendix 2, section 2.2, sub-section 2.2.2: A).

In an attempt to find out why the pronoun was not faster than the noun in context-target pairs 1,4,9,12 and 14, we compared the reaction time of the context sentences in these pairs to the reaction time of the context sentences in the remaining 11 context-target pairs (where the pronoun was faster than the noun). This analysis showed that the reaction time of the context sentences in context-target pairs 1,4,9, 12 and 14 was considerably slower than the reaction time of the context sentences in the remaining context-target pairs. The reaction time of the context sentences in the former context-target pairs was an average of 10.9 centiseconds slower than the reaction time of the context sentences in the latter context-target pairs. Possibly, the greater amount of processing involved in the interpretation of the context sentences in context-target pairs 1,4,9,12 and 14 (as reflected by the difference in the reaction time of these sentences and the context sentences in the remaining context-target pairs) may have made the referent less accessible (by the time it is referred to by the anaphor) in context-target pairs 1,4,9,12 and 14 than in the remaining context-target pairs. This in turn might explain why the pronoun did not work better than the noun in context-target pairs 1,4,9,12 and 14.

6.10 DISCUSSION

1. The results of the first experiment showed that the pronoun was faster than the noun when the referent is [CSnu] as in 4 below:

4. Tom jumped the fence

a. He/b.Tom fell to the ground.

The first explanation offered for these results is that when the pronoun is used (as in 4a), the listener will have no doubt that the same referent is being talked about whereas when the noun is repeated (as in 4b), the listener will not be able to know whether the referent of the second noun is the same or different from that of the first noun.

The results of this experiment seem to reject this explanation. The pronoun was faster than the noun not only when the referent is [CSnu] (experiment 1) but also when the referent is [CSu] (experiment 2). If this explanation were to be supported, then there should have been no difference between the reaction time of the pronoun and the noun when the referent is [CSu]. This is because the only argument made by this explanation against noun repetition does not apply in the case of [CSu] referents. When the referent is [CSu], the listener will have no doubt that both the pronoun and the noun refer to the same individual as the antecedent noun phrase. Consider 5 below which is one of the context-target pairs used in experiment 2:

5. Princess Anne lives in Gloucestershire.

a. She/b. Princess Anne is fourth in line to the throne.

In 5 above, it could not be argued that the listener will not be able to know that the second Princess Anne refers to the same individual as the first Princess Anne. Both she and the second Princess Anne explicitly signal to the listener that the same individual is bing talked about in the two sentences. Nevertheless, and as the result of the second experiment showed, the subjects understood the pronoun sentences significantly faster than the noun sentences in sentences like 5 above (when the referent is [CSu]). What these results suggest, then, is that the claim on which the first explanation is based is invalid.

Otherwise, there should have been no difference between the reaction time of the pronoun and the noun sentences in experiment 2.

2. Since the results of this experiment seem to reject the explanation given in (1), we are left with the second explanation to account for the results concerning the difference between the pronoun and the noun when the referent is [CSnu] (experiment 1). The argument we want to present now is that this second explanation will account not only for the results concerning the difference between the pronoun and the noun when the referent is [CSnu] but also for the results concerning the difference between the pronoun and the noun where the referent is [CSu] (experiment 2).

According to this second explanation, the first explanation does not take account of the 'Communicative principles' shared by the speaker and the listener in an actual communicative situation. Such principles include:

A. The co-operative principle (Grice, 1967):

The listener assumes, among other things, that the speaker is co-operative and, therefore, that he has no intention of deceiving or misleading him. On the basis of this principle, the second explanation argues that (when the referent is [CSnu]),the listener will understand that the same referent is bing talked about even when the noun is repeated (as in 4b above).

B. Message organisation principles:

One of these principles (the one relevant here) is that the listener expects a current subject referent to be referred back to by the pronoun and not by the noun regardless of whether the referent is [CSnu] or [CSn]. If this principle is ignored (as in 4b and 5b above), then the listener will have some difficulty in processing the sentence. If, on the other hand, this principle is adhered to (as in 4a and 5a above), then the listener will have no difficulty in processing the sentence.

The argument advocated by this second explanation could be summarized as follows:

a. In actual communicative situations, sentences like 4a and 4b above (experiment 1) convey the same 'cognitive' message (principle A). This message, however, is more appropriately packaged by the use of sentence 4a than by the use of sentence 4b (the principle given in B). Because of this, the subjects in experiment one took longer to understand sentences like 4b than sentences like 4a.

b. The argument in (a) applies not only to sentences like 4a and 4b but also to sentences like 5a and 5b. Like sentences 4a and 4b, sentences 5a and 5b convey the same message. Note that this is true about sentences 5a and 5b by virtue of the nature of the referent (principle A is not needed in such cases). Like sentences 4a and 4b, sentences 5a and 5b differ in that the message is more appropriately packaged by the use of sentence 5a than by the use of sentence 5b. Because of this, the subjects in experiment two took longer to understand sentences like 5b than sentences like 5a.

3. The important general finding from this experiment is that the way in which the message is packaged to the listener may in itself be a factor in comprehension. An interesting analogy could be made between sentence 6b below as opposed to 6a and sentence 7b as opposed to sentence 7a:

6. Hitler rose to power in 1933.

a. He/b. Hitler committed suicide in 1945.

7. (uttered in a crowded railway station: a long queue stretching behind):

a. A day-return ticket to Aberdeen, please.

b. Could you give me a day-return ticket to Aberdeen, please.

The pronoun in 6a and the noun in 6b convey the same speech act (an act of reference to a current subject referent). However, this act is more appropriately realized by the pronoun than by the noun. The same argument seems to apply to 7a as opposed to 7b. The two sentences convey the same speech act (a request). However, and in that context, the act is more appropriately realized by 7a than by 7b. The subjects in our experiment took longer to understand sentences like 6b than sentences like 6a. Possibly, the listener will take longer to process 7b than 7a.[1] As a result, the speaker of 7a may be served more quickly than the speaker of 7b.

---

(1) Consistent with this prediction, Gibbs (1981) reported an experiment the results of which showed that subjects took longer to process unconventional indirect requests than conventional ones.

CHAPTER SEVEN

EXPERIMENT THREE

7.1 AIMS OF THE EXPERIMENT:

In the previous two experiments we were concerned with Current [C] referents. In this experiment we turn our attention to Displaced [D] referents. [D] referents are those whose two mentions in the discourse are separated by intervening sentences concerned with a different referent as in 1 and 2 below:

1. The woman sold the house.

It was very big.

a. She/b. The woman was desperately in need of money.

2. The woman sold the house.

It was very big.

It contained 18 bedrooms.

It had a swimming pool.

a. She/b.The woman was desperately in need of money.

[D] referents could be classified in two ways:

A. The first classification is based on whether the first mention of the referent is made by a noun phrase functioning as surface subject or whether it is made by a noun phrase functioning as surface object. If the first mention of the referent is made by a noun phrase functioning as surface subject, then the referent will be referred to as Displaced Subject (DS] referent. 1 and 2 above examplify this type of referent.

If, on the other hand, the first mention of the referent is made by a noun phrase functioning as surface object, then the referent will be referred to as Displaced Object (DO) referent.

Three and four below exemplify this type of referent:

3. The mother picked up the baby.

She had been washing nearly all afternoon.

a.It/b. The baby was greatly in need of comfort.

4. The mother picked up the baby.

She had been washing nearly all afternoon.
She would not be finished for some time.
She was very tired.
a. It/b. The baby was greatly in need of comfort.

B. The second classification is based on whether the two mentions of the referent are separated by one intervening sentence concerned with a different referent or by three intervening sentences concerned with a different referent.

If the two mentions of the referent are separated by one intervening sentence concerned with a different referent, then the referent will be referred to as Displaced 1 [D1] referent. One and three above exemplify this type of referent.

If, on the other hand, the two mentions of the referent are separated by three intervening sentences concerned with a different referent, then the referent will be referred to as Displaced 3 [D3] referent. Two and four above exemplify this type of referent.

In addition to the contrasts [DS] v. [DO] and [D1] v. [D3], the following contrasts could be identified by combining classification A and B above:

1. [D1S] v [D3S] : 1 v. 2
2. [D1O] v [D3O] : 3 v. 4
3. [D1S] v [D1O] : 1 v. 3
4. [D3S] v [D3O] : 2 v. 4

The present experiment is a replication of the experiment performed by Sanford and Garrod (1978). Within the framework of the experimental technique adopted in this study, the major hypotheses tested in this experiment could be stated as follows:

1. When the pronoun and the noun are taken together and when [O1] and [O3] are taken together, [DS] referents will be interpreted faster than [DO] referents (1 a, b and 2 a, b V. 3 a, b and 4 a, b).

2. When [O1] and [O3] are treated together and when [OS] and [OO] are treated together, the referent will be interpreted faster when its second mention is made by the repetition of the antecedent noun phrase than when it is made by the pronominal form of that noun phrase (1 b, 2 b, 3 b, and 4 b V. 1 a, 2 a, 3 a, and 4 a).

3. A. The difference between the listening time of the pronoun and the noun is affected by whether the referent is [DS] or [DO]:

(i) For [DS] referents, there will be no difference between the listening time of the noun and the pronoun (1 b and 2 b V. 1 a and 2 a).

(ii) For [DO] referents, the noun will be faster than the pronoun (3 b and 4 b V. 3 a and 4 a).

B. The difference between the listening time of [DS] and [DO] referents is affected by whether the anaphoric form is the pronoun or the noun.

(i) When the anaphoric form is the pronoun, [DS] referents will be interpreted faster than [DO] referents (1 a and 2 a V. 3 a and 4 a).

(ii) When the anaphoric form is the noun, there will be no difference between the listening time of [DS] and [DO] referents (1 b and 2 b V. 3 b and 4 b).

4. When the Pronoun and the noun are taken together and when [OS] and [OO] are taken together, [D3] referents will take longer to interpret than [D1] referents (2 a, b and 4 a, b V. 1 a, b and 3 a, b).

5. Although the Noun may be faster than the Pronoun for [D1] and [D3] referents, it is expected that the difference between the listening time of the Noun and the listening time of the Pronoun will be greater for [D3] referents than for [D1] referents:

7.2 MATERIALS:

Examples of the passages used in the experiment are given in 5 A and 5B below:

5. A. Subject passage:

John scored the goal.

It came 10 minutes before the end of the match.

* It was a header.

* It was a fine goal.

He/John was absolutely delighted.

Did the goal come 10 minutes before the end of the match?

B. Object passage:

The ball hit Tony.

It came from the direction of the playgrounds.

* It was very heavy.

* It was covered with mud.

He/Tony was extremely angry.

Did the ball come from the direction of the playgrounds?

The passages used in the experiment are given in Appendix 3, section 3.1. The following points should be noted about these passages.

1. The experimental passages differed in three ways:

A. In half the passages the critical antecedent was the surface subject of the first sentence and in the other half the critical antecedent was the surface object of the first sentence.

B. Reference in the target was made by either the pronominal form of the antecedent noun phrase or by the repetition of that noun phrase.

C. The two mentions of the referent were separated by either one intervening sentence or by three intervening sentences. The subject of each of the intervening sentences in the subject passages refers to the object of the first sentence and the subject of each of the intervening sentences in the object passages refers to the subject of the first sentence.

2. A. The subject's and the object's target sentences were carefully equated in terms of length, syntactic and semantic difficulty. To illustrate, compare the subject target sentences in 5A above to the object target sentences in 5B above:

(i) The two types of target sentences have the same length in words.

(ii) The two types of target sentences have the same syntactic structure.

(iii) The two types of target sentences are attributive. 'absolutely' and 'extremely' have similar meanings. 'delighted' and 'angry' have opposite meanings. Nevertheless, it is highly likely that both lexical items would be equally comprehensible to the subjects.

B. The critical subject and object antecedents were carefully equated in terms of their image-value (James, 1972). In addition to that, the object nouns in the first sentence in the subject passages and the subject nouns in the first sentence in the object passages were also carefully equated in terms of their image-value.

A list which contains the image-value for 925 nouns (Paivio et al, 1968) was consulted for this purpose.

C. An attempt was also made to equate the intervening sentences in the subject and the object passages in terms of length, syntactic and semantic difficulty.

3. Each of the passages was followed by a question. Half the questions required the answer 'Yes' and the other half required the answer 'No'. The purpose of the question was to check the subjects' understanding of the passages. In an attempt to force the subjects to concentrate on all the sentences in each passage, the following steps were taken:

A. Half the questions were about the target sentence (the sentence immediately preceding the question) and the other half were about the second sentence in the passage (the sentence which did not immediately precede the question). A further advantage of this is that we would have an opportunity to compare the reaction time to the question when it was about the sentence immediately preceding it with the reaction time to the question when it was not about the sentence immediately preceding it.

B. The subjects were not told that the question could be either about the target sentence or the second sentence in the passage. Rather, they were told that the question could be about any sentence in the passage. To give the subjects the impression that this was the case, the question in one of the trials in the PRACTICE TEST (a three intervening sentences trial) was about the third sentence in the passage.

4. There were 24 passages. Half of these were subject passages (the target contained a reference to the subject of the first sentence) and the other half were object passages (the target contained a reference to the object of the first sentence). From the passages, the following treatments were identified:

A. S + 1/P	E. O + 1/P
B. S + 3/P	F. O + 3/P
C. S + 1/N	G. O + 1/N
D. S + 3/N	H. O + 3/N

7.3 MAKING THE DATA TAPES:

The experimental tapes were made in the same way as in the second experiment. There was, however, one slight modification. A gap of blank tape (length in time was about 20 seconds) was allowed between the sentence 'END OF PRACTICE TEST' and the tone immediately preceding the 'EXPERIMENTAL TEST'. Thus, even if the subject pressed the button with the intention to start the 'EXPERIMENTAL TEST' before he was given the signal to do so (as some few subjects did in the previous experiment), the 'EXPERIMENTAL TEST' would only begin after the 20 seconds time interval. It was thought that this time interval would be quite enough for the experimenter to be with the subject before the 'EXPERIMENTAL TEST' was started. By the time the experimenter gave the final instructions to the subject, the tape recorder would have stopped in a position ready for the 'EXPERIMENTAL TEST'.

7.4 SUBJECTS:

Twenty-eight native speakers of English took part in the experiment. All the subjects were undergraduate students at Edinburgh University. Each subject received 60p for his participation.

7.5 DESIGN:

There were 96 experimental trials. These trials were divided into 4 blocks [Block 1,2,3 and 4]. Each block contained 24 trials. Half of these are subject trials and the other half are object trials.

Each of the eight treatment combinations was represented by three trials in each block. The subject trials in a block were the counterparts of the object trials in that block. Thus, for example, if a block contained a S + 1/P, it would also contain the object counterpart of this trial (ie. the O + 1/P).

Blocks 1 and 2 differed in that the + 1 trials in Block 1 were the counterparts of the + 3 trials in Block 2 and the + 1 trials in Block 2 were the counterparts of the + 3 trials in Block 1. The same was also the case with regard to the difference between the trials in Block 3 and the trials in Block 4.

Block 1 and 3 differed in that the P trials in Block 1 were the counterparts of the N trials in Block 3 and the P trials in Block 3 were the counterparts of the N trials in Block 1. The same was also the case with regard to the difference between the trials in Block 2 and the trials in Block 4.

The order in which the trials were presented in Block 1 was random. The position of each of the trials in Blocks 2, 3 and 4 was the same as that of its counterparts in the other blocks. The subjects were randomly divided into 4 groups (each group consisted of 7 subjects). Each group was presented with one of the blocks.

7.6 EQUIPMENT AND PROCEDURE:

The equipment and the experimental procedure were identical to those in the previous experiment. The listening time for each sentence was calculated in the same way as in the previous experiment.

7.7. RESULTS:

7.7.1 Main results:

1. The experimental plan:

A schematic representation of the experimental plan is given below:

	S		O	
	P	N	P	N
+ 1	X	X	X	X
+ 3	X	X	X	X

The summary of the analysis of variance by subjects is given in Appendix 3, section 3.3., sub-section 3.3.1: H and the summary of the analysis of variance by sentences is given in Appendix 3, section 3.3, sub-section 3.3.2: H.

A. Antecedent (S v. O):

The mean listening times for the Subject's referent and the Object's referent are given in Table 7.7.1 below:

Table 7.7.1.: Mean Listening times as a function of Antecedent (Subject and Object).

S	O
78.5	83.8

The subject's referent was interpreted an average of 5.3 centiseconds faster than the object's referent. This effect was reliable by subjects but unreliable by sentences or min F':

F1 (1,27) = 16.84, P $<$ .0003

F2 (1,11) = 3.19, P $>$ .05

Min F' (1,15) = 2.68 P $>$ .05

B. Anaphoric form (P v. N):

The mean listening times for the pronoun and the noun are given in Table 7.7.2 below:

Table 7.7.2: Mean listening times as a function of Anaphoric form (pronoun and noun).

P	N
84.2	78.2

The noun was faster than the pronoun by an average of 6 centiseconds. This effect was reliable by subjects but not reliable by sentences or min F':

F1 (1,27) = 13.32, P < .0011

F2 < 1

Min F' < 1

C. Distance (+1 v. +3):

The mean listening times for +1 and +3 are given in Table 7.7.3 below:

Table 7.7.3: Mean listening times as a function of Distance between the Anaphor and the Antecedent (+1 and +3):

+1	+3
81.8	80.5

The difference between the listening time of +1 and +3 conditions was not reliable by all measures: all three F-ratios have a value of less than 1.

D. Antecedent and Anaphoric form interaction (P v. N (S) V. P v. N (O) / S v. O (P) V. S v. O (N):

The mean listening times for the pronoun and the noun when the antecedent is subject and object are given in table 7.7.4 below:

Table 7.7.4: Mean listening times for the pronoun and the noun (antecedent subject and object).

	P	N
S	78.8	78.2
O	89.5	78.1

The antecedent and the anaphoric form interaction was reliable by all three measures:

F1 (1,27) = 14.45, P < .0007

F2 (1,11) = 9.92, P < .01

Min F' (1,26) = 5.88, P < .025

In order to gain insight into the nature of this interaction, we have plotted it in Figure 7.7.1 below:

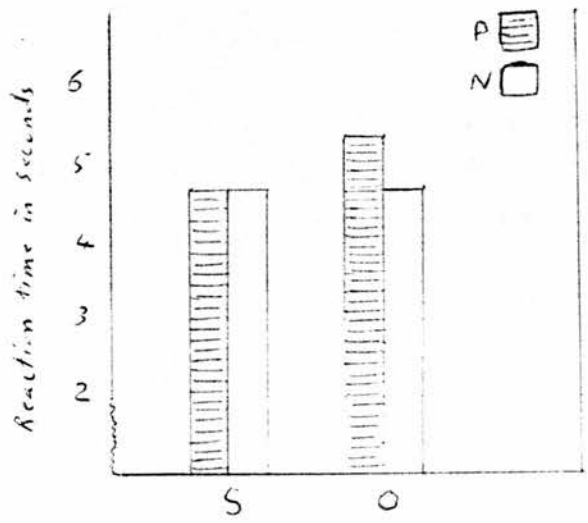


Figure 7.7.1: A plot of the Antecedent and Anaphoric form interaction

From this figure and the means in Table 7.7.4 it could be seen that:

1. when the antecedent is subject, the pronoun and the noun were alike whereas when the antecedent is object, the noun was faster than the pronoun.

2. When the anaphoric form is the pronoun, the subject was faster than the object whereas when the anaphoric form is the noun, the subject and the object were alike.

E. Distance and Antecedent interaction:

The mean listening times for the subject and the object after one intervening sentence (+1) and three intervening sentences (+3) are given in Table 7.7.5 below.

Table 7.7.5: Mean listening times for the subject and the object (+1 and +3).

	S	O
+1	78.7	85
+3	78.4	82.7

The distance and the antecedent interaction was unreliable by all measures: all three F-ratios have a value of less than 1. As could be seen from the means in table 7.7.5, the subject was faster than the object after one intervening sentence and after three intervening sentences.

F. Distance and Anaphoric form interaction:

The mean listening times for the pronoun and the noun at +1 and +3 are given in Table 7.7.6 below:

Table 7.7.6: Mean listening times for the pronoun and the noun (+1 and +3).

	P	N
+1	83.6	80.1
+3	84.8	76.3

The distance and the anaphoric form interaction was unreliable by all measures:

F1 (1,27) = 1.16, P $\geq$ .05

F2 $<$ 1

Min F' $<$ 1

G. Distance X Antecedent X Anaphoric form interaction

The three-way interaction was not reliable by all measures:

F1 (1,27) = 1.29, P $>$ .05

F2 (1,11) = 1.19, P $>$ .05

Min F' $<$ 1

2. In order to make a detailed analysis of the experimental data, the experimental plan was broken down into a number of sub-plans. The major issues investigated in these sub-plans are:

1. P v. N [Antecedent subject]: sub plan 1
2. P v. N [Antecedent object]: sub plan 2
3. S v. O [Anaphoric form pronoun]: sub plan 3
4. S v. O [Anaphoric form noun]: sub plan 4
5. Antecedent and Anaphoric form interaction (at +1): sub plan 5
6. Antecedent and Anaphoric form interaction (at +3): sub plan 6.

The analysis of variance by subjects and by sentences was carried out on each of these sub plans. The results of this analysis are given in 3 to 8 below:

3. Sub-plan 1:

This sub-plan may be schematically represented as follows:

S

	P	N
+1	X	X
+3	X	X

The summary of the analysis of variance by subjects is given in Appendix 3, section 3.4, sub-section 3.4.1: D and the summary of the analysis of variance by sentences is given in Appendix 3, section 3.4, sub-section 3.4.2: D.

A. Anaphoric form (at S):

The noun was faster than the pronoun by an average of .6 centiseconds (see table 7.7.4 above). This difference was unreliable by all measures: all three F-ratios have a value of less than 1.

B. Distance (at S): difference between +1 and +3 when the antecedent is subject:

The difference between the listening time of +1 and +3 (see table 7.7.5 above) was unreliable by all measures: all three F-ratios have a value of less than 1.

C. Distance and anaphoric form interaction (at S):

The mean listening times for the pronoun and the noun at +1 and +3 (antecedent subject) are given in Table 7.7.7. below.

Table 7.7.7: Mean listening times as a function of anaphoric form (P and N), Distance (+1 and +3): Antecedent S.

	S	
	P	N
+1	78.6	78.7
+3	79	77.7

The distance and the anaphoric form interaction (at S) was unreliable by all measures: all three F-ratios have a value of less than 1.

D. Simple effects of anaphoric form:

D. 1 At S + 1 [P v. N: Antecedent S, Distance +1]:

D. 2 At S + 3 [P v. N: Antecedent S, Distance +3]:

The difference between the listening time of the pronoun and the noun at S +1 and the difference between the listening time between the pronoun and the noun at S +3 [see table 7.7.7. above] were unreliable by all measures: all six F-ratios have a value of less than 1. [For the denominators and degrees of freedom of F-ratios for simple effects in factorial repeated-measures designs see Winner (1971)].

E. Simple effects of distance:

E.1 At S/P [+1 v. +3: Antecedent S, Anaphoric form P]:

E.2 At S/N [+1 v. +3: Antecedent S, Anaphoric form N]:

The difference between the listening time of +1 and +3 at S/P and the difference between the listening time of +1 and +3 at S/N [see table 7.7.7.] were unreliable by all measures: all six F- ratios have a value of less than 1.

4. Sub-plan 2:

The form of this sub-plan is the same as that of the previous sub-plan. The only difference is that whereas in the previous sub-plan the antecedent is subject, in this sub-plan the antecedent is object.

The summary of the analysis of variance by subjects is given in Appendix 3, section 3.5, sub-section 3.5.1: D and the summary of the analysis of variance by sentences is given in Appendix 3, section 3.5, sub-section 3.5.2:D.

A. Anaphoric form (at 0):

The noun was faster than the pronoun by an average of 11.4 centiseconds (see table 7.7.4 above). This effect was reliable by subjects but unreliable by sentences or min F':

F1 (1,27) = 26.73, $P < .001$

F2 (1,11) = 2.15, $P > .05$

Min F' (1,13) = 1.99, $P > .05$

B. Distance (at 0):

The difference between the listening time of +1 and +3 (Antecedent 0: see table 7.7.5) was unreliable by all measures: all Fs have a value of less than 1.

C. Distance and Anaphoric form interaction (at 0):

The mean listening times for the pronoun and the noun at +1 and +3 (Antecedent object) are given in table 7.7.8 below.

Table 7.7.8: Mean listening times as a function of Anaphoric form and Distance: Antecedent object:

0

	P	N
+1	88.5	81.4
+3	90.5	74.8

The distance and anaphoric form interaction (at 0) was marginally reliable by subjects but unreliable by sentences and min F':

F1 (1,27) = 3.28, critical value for P = .10 is 2.90

F2 < 1

Min F' < 1

Although the noun was faster than the pronoun at +1 and +3 (Antecedent 0), the difference between the listening time of the noun and the pronoun at +3 was greater than that between the noun and the pronoun at +1 (15.7 to 7.1 centiseconds). Compare this to the difference between P and N at +1 as opposed to the difference between P and N at +3 (Antecedent subject: Table 7.7.7.).

D. Simple effects of Anaphoric form:

D.1 At 0 +1 [P v. N, Antecedent Object, Distance +1]:

The noun was faster than the pronoun by an average of 7.1 centiseconds. This effect was reliable by subjects only:

F1 (1,54) = 4.72, P $<$ .05

F2 $>$ 1

Min F' $>$ 1

D.2 At 0 +3:

When the antecedent is 0 and when the distance is +3, the noun was faster than the pronoun by an average of 15.7 centiseconds. This effect was reliable by subjects only:

F1 (1,54) = 23.39, P $<$ .001

F2 (1,21) = 1,63, P $>$ .05

Min F' (1,24) = 1.52, P $>$ .05

E. Simple effects of Distance:

E.1 +1 V. +3 [at O/P]:

+1 was faster than +3 by an average of 2 centiseconds (see table 7.7.8.) This effect was unreliable by all measures: all three Fs have a value of less than 1.

E.2 +1 V. +3 [at O/N]:

+3 was faster than +1 by an average of 6.6 centiseconds (see table 7.7.8). This effect was not significant by all measures:

F1 (1,50) = 2.73, P $>$ .05

Both F2 and Min F' have a value of less than 1.

5. Sub-plan 3:

This sub-plan may be schematically represented as follows:

	P	
	S	O
+1	X	X
+3	X	X

The summary of the analysis of variance by subjects is given in Appendix 3, section 3.6, sub-section 3.6.1: D and the summary of the analysis of variance by sentences is given in Appendix 3, section 3.6, sub-section 3.6.2: D.

A. Antecedent (at P):

When the Anaphoric form is the pronoun, the subject was faster than the object by an average of 10.7 centiseconds (see table 7.7.4). This effect was reliable by all measures:

F1 (1,27) = 32.14, P < .001

F2 (1,11) = 13.13, P < .005

Min F' (1,20) = 9.32, P < .01

B. Distance (at P):

The difference between the listening time of +1 and +3 (Anaphoric form P: see table 7.7.6) was unreliable by all measures: all Fs have a value of less than 1.

C. Distance and Antecedent interaction (at P):

The mean listening times for the subject and the object at +1 and +3 (Anaphoric form pronoun) are given in table 7.7.9 below.

Table 7.7.9: Mean listening times as a function of Antecedent and Distance: Anaphoric form P

	P	
	S	O
+1	78.6	88.5
+3	79	90.5

This interaction was unreliable by all measures: all three Fs have a value of less than 1. As could be seen from table 7.7.9, the subject was faster than the object at +1 and at +3.

D. Simple effects of Antecedent:

D.1 At P +1 [S v. O, Anaphoric form P, Distance +1]:

The subject was faster than the object by an average of 9.9 centiseconds (see table 7.7.9). This effect was reliable by all measures:

F1 (1,25) = 10.74, $P < .005$

F2 (1,21) = 6.77, $P < .025$

Min F' (1,48) = 4.15, $P < .05$

D.2 At P +3 [S v. O, Anaphoric form P, Distance +3]:

The subject was faster than the object by an average of 11.5 centiseconds (see table 7.7.9). This effect was reliable by all measures:

F1 (1,52) = 14.54, $P < .001$

F2 (1,21) = 9.17, $P < .01$

Min F' (1,48) = 5.62, $P < .025$

6. Sub-plan 4:

The form of this sub-plan is the same as that of the previous sub-plan. The only difference is that whereas in the previous sub-plan the Anaphoric form is the pronoun, in this sub-plan the anaphoric form is the noun.

The summary of the analysis of variance by subjects is given in Appendix 3, section 3.7, sub-section 3.7.1: D and the summary of the analysis of variance by sentences is given in Appendix 3, section 3.7, sub-section 3.7.2: D.

A. Antecedent (at N):

The difference between the listening time of the subject and the object (at N: see table 7.7.4) was unreliable by all measures with min F' and the individual Fs by subjects and sentences all having a value of less than 1.

B. Distance (at N):

When the Anaphoric form is the noun, +3 was faster than +1 by an average of 3.8 centiseconds (see table 7.7.6 above). This effect was unreliable by all measures:

F1 (1,27) = 1.17, P $>$ .05

F2 $<$ 1

Min F' $<$ 1

C. Distance and Antecedent interaction (at N):

The mean listening times for the subject and the object at +1 and +3 (Anaphoric form noun) are given in Table 7.7.10 below.

Table 7.7.10: Mean listening times as a function of Antecedent and Distance: Anaphoric form N.

	N	
	S	O
+1	78.7	81.4
+3	77.7	74.8

The Distance and Antecedent interaction (at N) did not approach the significance level by all measures:

F1 < 1

F2 (1,11) = 2.75, P $> .05$

Min F' < 1

D. Simple effects of Antecedent:

D. 1 At N +1:

D. 2 At N +3:

There was no reliable effect in either D.1 or D.2: all six Fs have a value of less than 1.

7. Sub-plan 5:

This sub-plan may be schematically represented as follows:

		P	N
+1	S	X	X
	O	X	X

The summary of the analysis of variance by subjects is given in Appendix 3, section 3.8, sub-section 3.8.1: D and the summary of the analysis of variance by sentences is given in Appendix 3, section 3.8, sub-section 3.8.2: D.

A. Antecedent (at +1):

At Distance +1, the subject was faster than the object by an average of 6.3 centiseconds (see Table 7.7.5 above). This effect was reliable by subjects and marginally reliable by sentences and min F':

F1 (1,27) = 9.19, P $< .01$

F2 (1,11) = 4.45, critical for P = .05 is 4.84

Min F' (1,22) = 2.998, P $< .10$

B. Anaphoric form (at +1):

At Distance +1, the noun was faster than the pronoun by an average of 3.5 centiseconds (see table 7.7.6 above). This effect did not approach the significance level by all measures:

F1 (1,27) = 1.53, P $>$ .05

F2 $<$ 1

Min F' $<$ 1

C. Antecedent and Anaphoric form (at +1):

The mean listening times for the pronoun and the noun at S and O (Distance +1) are given in table 7.7.11 below.

7.7.11: Mean listening times as a function of Antecedent and Anaphoric form: Distance +1

		P	N
+1	S	78.6	78.7
	O	88.5	81.4

The Antecedent and Anaphoric form interaction (at +1) was unreliable by all measures:

F1 (1,27) = 2.11, P $>$ .05

F2 (1,11) = 1.37, P $>$ .05

Min F' $<$ 1

8. Sub-plan 6:

The form of this sub-plan is the same as that of the previous sub-plan. The only difference is that whereas in the previous sub-plan the distance is +1, in this sub-plan the distance is +3.

The summary of the analysis of variance by subjects is given in Appendix 3, section 3.9, sub-section 3.9.1: D and the summary of the analysis of variance by sentences is given in Appendix 3, section 3.9, sub-section 3.9.2: D.

A. Antecedent (at +3):

At Distance +3, the subject was faster than the object by an average of 4.3 centiseconds (see table 7.7.5 above). This effect did not approach the significance level by all measures:

F1 (1,27) = 2.36, P > .05

F2 (1,11) = 1.57, P > .05

Min F' < 1

B. Anaphoric form (at +3):

At Distance +3, the noun was faster than the pronoun by an average of 8.5 centiseconds (see table 7.7.6). This effect was reliable by subjects but unreliable by sentences and min F':

F1 (1,27) = 8.66, P < .01

F2 < 1

Min F' < 1

C. Antecedent and Anaphoric form interaction (at +3):

The mean listening times for the pronoun and the noun at S and O [+3] are given in table 7.7.12 below.

Table 7.7.12: Mean listening times as a function of Antecedent and Anaphoric form: Distance +3.

+3

	P	N
S	79	77.7
O	90.5	74.8

The Antecedent and Anaphoric form interaction (at +3) was highly reliable by all measures:

F1 (1,27) = 16.86, $P < .001$

F2 (1,11) = 24.44, $P < .001$

Min F' (1,36) = 9.98, $P < .005$

In order to gain insight into the nature of this interaction, we have plotted it in figure 7.7.2 below. From this figure and the means in table 7.7./2 it could be seen that:

1. When the Antecedent is subject [+3], the pronoun and the noun were alike, whereas when the Antecedent is object [+3], the noun was faster than the pronoun.

2. When the Anaphoric form is the pronoun [+3], the subject was faster than the object whereas when the Anaphoric form is the noun [+3], the subject and the object were alike.

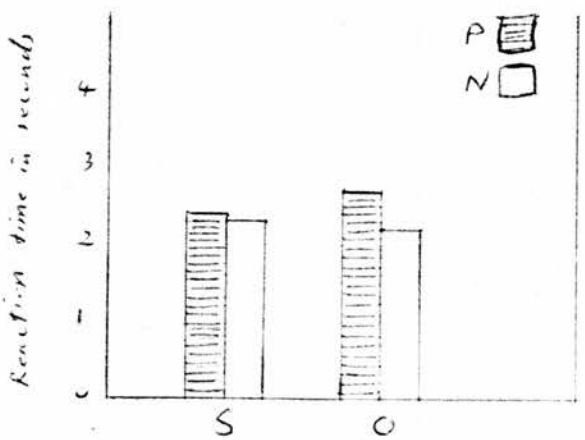


Figure 7.7.2: A plot of the Antecedent and Anaphoric form interaction (Distance + 3)

7.2 Results relating to the main results:

1. Analysis of response time to the question: Foreground [F] v. Background [B]

For the purpose of this analysis, a formal distinction is made between [F] and [B] information. This distinction is based on whether the information conveyed by a sentence (hereafter referred to as the critical information) and a question about that information are not separated by intervening sentences containing other information or whether they are separated by intervening sentences containing other information. If the critical information and the question are not separated by intervening sentences containing other information, then the critical information will be referred to as [F] information. Six below exemplifies [F] information:

6. The engineer repaired the refrigerator.
It had been out of order for 2 weeks.
He took 3 hours to repair it.
Did the engineer take 2 hours to repair the refrigerator?

If, on the other hand, the critical information and the question are separated by intervening sentences containing other information, then the critical information will be referred to as [B] information. Seven below exemplifies [B] information:

7. The engineer repaired the refrigerator.
It had been out of order for 2 weeks.
It was second hand.
It was six years old.
He took 3 hours to repair it.
Had the refrigerator been out of order for 5 weeks?

Note that the formal definition of [F] information is very similar to the formal definition of [C] referents and the formal definition of [B] information is very similar to the formal definition of [D] referents:

A. [C] referents: no intervening sentences containing other referents between the two mentions of the referent.

B. [D] referents: intervening sentences between the two mentions of the referent containing other referents.

In the case of [C] and [D] referents, the listener's job is to relate the second mention of the referent to its first mention. In the case of [F] and [B] information, the listener's job is to provide an answer to the question about the information.

The present analysis has two purposes:

1. To compare reaction time to the question about [F] information with reaction time to the question about [B] information.

2. Since the status of [F] information in memory is likely to be very similar to the status of [C] referents and since the status of [B] information is likely to be very similar to the status of [D] referents, the comparison in 1. may provide us with some clues concerning the difference between the listening time of [C] and [D] referents. This is specially important since neither in the present experiment nor in the previous two experiments could we compare the listening time of [C] referents with that of [D] referents.

The mean response times to the question about [F] and [B] information are given in table 7.7.13 below.

Table 7.7.13: Mean response times to the question about [F] and [B] information:

F	B
71.4	92.4

Response time to the question about [F] information was faster by an average of 21 centiseconds than response time to the question about [B] information. The analysis of variance by subjects showed that this difference was highly reliable, $F(1,27) = 34.21$, $P < .001$. The summary of this analysis is given in Appendix 3, section 3.10: C. The analysis of variance by materials was not carried out because the [F] and the [B] passages were not comparable.

2. Analysis of response time to the question: Foreground [F] V. Background 1 [B1] v. Background 3 [B3].

The data used in the previous analysis was also used in this analysis. However, in this analysis [B] information was divided into [B1] and [B3] information. This distinction is based on whether the critical information and the question are separated by one intervening sentence containing other information ([B1] information) or by three intervening sentences containing other information ([B3] information).

[B1] information is exemplified by 8 below:

8. The engineer repaired the refrigerator.
It had been out of order for 2 weeks.
He took 3 hours to repair it.
Had the refrigerator been out of order for 5 weeks?

[B3] information is exemplified by 7 above.

Note that the formal definition of [B1] information is very similar to the formal definition of [D1] referents and the formal definition of [B3] information is very similar to that of [D3] referents. [Compare the definitions of [D1] and [D3] referents (see section 7.1) with those of [B1] and [B3] information].

One of the main results of the present experiment showed that there was no reliable difference between the listening time of [D1] and [D3] referents (ie no difference between +1 and +3 conditions). Since the status of [D1] referents in memory is likely to be similar to the status of [B1] information whereas the status of [D3] referents is likely to be similar to that of [B3] information, and since the main results of the present experiment showed no reliable difference between the listening time of [D1] and [D3] referents, one would expect no reliable difference between response time to the question about [B1] information and response time to the question about [B3] information. Because in the present analysis the number of the sentences under each of the three treatments was not equal (each subject was presented with 12 [F], half the subjects were presented with 5 [B1] and 7 [B3] and the other half with 7 [B1] and 5[B3], we calculated the mean score for each subject under each treatment. These mean scores were then used for the purpose of the analysis of variance. The summary of this analysis is given in Appendix 3, section 3.11: C. The mean response times to the question for the three conditions are given in table 7.7.14 below.

Table 7.7.14: Mean response times to the question for [F], [B1] and [B3].

F	B1	B3
71.4	90.4	97.2

The results of the analysis of variance showed a significant condition effect, $F(2,54) = 14.4$, $P < .001$. Having obtained an overall significant F- ratio, the next step in the analysis was to test the difference between the response time to the question about [F] and [B1], [F] and [B3], and finally [B1] and [B3]. The q-statistic was used for this purpose. The results are given below.

A. [F] v. [B1]: [F] was significantly faster than [B1], $P < .01$

B. [F] v. [B3]: [F] was significantly faster than [B3], $P < .01$

C. [B1] v. [B3]: as expected, there was no reliable difference between [B1] and [B3].

For the calculation of the q-statistic for each of the three comparisons see Appendix 3, section 3.11: D.

3. Replicating one of the findings from Experiment 1: [CS] v. [CO]/ Anaphoric form pronoun.

One of the results of experiment 1 showed that there was no reliable difference between the listening time of [CS] and [CO] referents (anaphoric form pronoun). The intervening sentence in the +1 condition in the present experiment offered us an opportunity to replicate this finding. Consider 9 and 10 below (the target sentences in the present analysis are underlined):

9. A. The boy scratched the Mercedes.

B. He ran away. TARGET

C. The Mercedes was standing by the kerb.

D. Did the boy run away after he scratched the Mercedes?

10. A. The Rolls Royce struck the woman.

B. She fell down unconscious. TARGET

C. The Rolls Royce was travelling at a very high speed.

D. Was the Rolls Royce travelling slowly when it struck the woman?

Sentences 9 C and 10 C were target sentences in the main analysis of the present experiment. Response time to the question about 9 B and 10 C were used in the previous two analyses. In the present analysis, the target sentences were 9 B (S + P) v. 10 B [O + P]. The mean times for [CS] and [CO] (anaphoric form P) are given in table 7.7.15 below.

Table 7.7.15: Mean times for [CS] and [CO] referents (anaphoric form P)

P

CS	CO
86.1	84.4

The summary of the analysis of variance is given in Appendix 3, section 3.12: C. Consistent with the results of Experiment 1, this analysis showed no reliable difference between listening time for [CS] and [CO] referents (anaphoric form P): $F < 1$.

4. Subject v. Object (Anaphoric form pronoun: intervening sentences in which the referent IS mentioned).

One of the major results of the present experiment showed that, when the anaphoric form is the pronoun and when there are intervening sentences in which the referent is NOT mentioned, the subject's referent was interpreted faster than the object's referent (ie [DS] faster than [DO]: anaphoric form P). The main purpose of the present analysis was to show that, when the anaphoric form is the pronoun and when there are intervening sentences in which the referent IS mentioned, there would be no difference between the listening time of the subject's referent and the listening time of the

object's referent. For the purpose of this analysis, we made use of the three intervening sentences in the +3 condition in the present experiment.

Consider 11 and 12 below (the target sentences are underlined):

11. A. Sally missed Jim.

B. She felt very lonely. TARGET

C. She was'nt very keen on getting out of the house. TARGET

D. She spent most of her time reading. TARGET

E. He had been doing some work abroad for 2 weeks.

F. Had Jim been doing some work abroad for 5 weeks?

12. A. Joe beat Cathy.

B. She got very angry. TARGET

C. She would'nt stay in the house any longer. TARGET

D. She went to live with her parents. TARGET

E. He had been drinking in the pub for 6 hours.

F. Had Joe been drinking in the pub for 8 hours?

Note that passage 11 was an object passage in the main analysis (Jim ... he) whereas it is a subject passage in the present analysis (Sally .... she/she/she) and that passage 12 was a subject passage in the main analysis (Joe ...he) whereas it is an object passage in the present analysis (Cathy ....she/she/she).

The referents in 11 and 12 could be classified in two different ways:

A. The pronoun in 11: BCD refers to the subject of 11A: subject's referent. The pronoun in 12: BCD refers to the object of 12A: object's referent.

B. So far, we have used the term [C] referents to refer to referents whose two mentions are not separated by intervening sentences containing other referents.

For the purpose of the present analysis, we need to broaden the definition of [C] referents in the following way:

[C] referents are not only those whose two mentions are not separated by intervening sentences containing other referents (as in 11/12: AB) but also those referents whose two mentions are separated by intervening sentences in which that referent is also mentioned (11/12: ABC /11/12: ABCD).

For our present purpose, the following three types of [C] referents could be identified:

1. [C0]: No intervening sentences containing other referents between the two mentions of the referent (eg. 11:AB and 12:AB). This is the sense in which we have used the term [C] referents in Experiments 1 and 2.

2. [C1]: The first and the current mentions of the referent are separated by a sentence in which the referent is also mentioned as in 11:ABC and 12:ABC.

3. [C2]: The first and the current mentions of the referent are separated by two sentences in which the referent is also mentioned as in 11:ABCD and 12:ABCD.

In this analysis, the experimental plan has the following form:

P

S			O		
C0	C1	C2	C0	C1	C2
X	X	X	X	X	X

The hypotheses tested could be stated as follows:

1. There will be no difference between the listening time of the subject's and the object's referents when [Co], [C1], and [C2] are treated together (ie. no difference between the listening time of sentences like 11:BCD and the listening time of sentences like 12:BCD).

2. There will be no difference between the listening time of [Co], [C1] and [C2] referents when subject and object antecedents are treated together (ie. no difference between the listening time of sentences like 11/12: B, 11/12:C and 11/12:D). If the main results of the present experiment showed that there was no difference between the listening time of [D1] and [D3] referents (even when the anaphoric form is the pronoun), then one could hardly expect a difference between the listening time of [Co], [C1] and [C2] referents.

3. The difference between [Co], [C1] and [C2] referents for the subject will be parallel to that between [Co], [C1] and [C2] referents for the object (ie. no interaction between type of Antecedent and type of Current is expected).

The mean listening times for the 6 treatment combinations are given in table 7.7.16 below:

Table 7.7.16: Mean listening times as a function of Antecedent (S and O) and type of Current [Co], [C1] and [C2]).

P	Co	C1	C2	
S	83.9	88.5	86.1	86.2
O	83.9	82	82	82.6
	83.9	85.3	84.1	

The summary of the analysis of variance is given in Appendix 3, section 3.13: E. As expected, the results of this analysis showed:

1. No reliable difference between the listening time of the subject's and the object's referents, $F(1,27) = 2.71$, $P > .05$.

2. No reliable difference between the listening time of [C0], [C1] and [C2] referents, $F < 1$.

3. No reliable interaction between Antecedent and type of current, $F(2,54) = 1.51$, $P > .05$.

7.7.3 Subsidiary analysis of the data:

1. Positive V. Negative:

The purpose of the present analysis was to find out whether there is any difference between the listening time of positive sentences and the listening time of negative sentences. Because the number of sentences under each treatment was not equal, we calculated the mean score for each subject under each treatment. These mean scores were then used for the purpose of the analysis of variance. The summary of this analysis is given in Appendix 3, section 3.14, subsection 3.14.1: C. The mean times for the positive and the negative sentences are given in table 7.7.17 below.

Table 7.7.17: Mean listening times for positive and negative sentences.

POS	NEG
83.7	87.8

As one might expect, the results of the analysis of variance showed that the positive sentences were comprehended significantly faster than the negative sentences, $F(1,27) = 5.13$, $P < .05$.

2. Agentive/Do not require integration V. Attributive/require integration.

The initial purpose of the present analysis was to compare listening time for agentive snetences (eg. John scored the goal) with listening time for attributive sentences (eg. He was happy). However, a closer examination of these sentences showed that they differ in one aspect which is more related to the aims of this study than the contrast agentive v. attributive:

A. Each of the agentive sentences used in this analysis is the first sentence in the passage as in 13: A below:

13. A. John scored the goal.

B. He was happy.

The comprehension of these sentences (eg. 13: A) does not require integration with previous sentences. For this reason, thse sentences are referred to as agentive/DRI.

B. On the other hand, the subject of each of the attributive sentences used in the analysis is a pronoun (13:B). The comprehension of these sentences requires integrating them with the preceding sentences. In other words, the pronoun has to be related to its antecedent before the sentence is comprehended. For this reason, these sentences are referred to as attributive/R1.

The hypothesis tested in the present analysis could be stated as follows:

Sentences which require integration with other sentences take longer to understand than sentences which do not require integration with other sentences.

Because in the present analysis the number of the sentences under each of the two treatments was not equal, we calculated the mean score for each subject under each treatment. These scores were then used for the purpose of the analysis of variance. The summary of this analysis is given in Appendix 3, section 3,14, sub-section 3.14.2: C. The mean listening times for the two treatments are given in table 7.7.18 below.

Table 7.7.18: Mean listening times for sentences which require integration and sentences which do not require integration.

Agen/DR1	Attrib/R1
80.7	86.9

As expected, the results showed that the sentences which do not require integration were understood significantly faster than the sentences which require integration, $F(1,27) = 8.46$, $P < .01$

3. Correlation between length of sentences (in words and time) and reaction time.

There was no reliable correlation between length of sentences in words and reaction time:

$r = -.013$ (with 94 df/not significant).

Moreover, there was no reliable correlation between length of sentences in time and reaction time:

$r = -.103$ (with 94 df/not significant).

7.8 DISCUSSION:

The discussion of the results consists of a number of points:

1. A. In Chapter 2, we have argued that the difference in effectness between pronouns and nouns is closely related to the cognitive accessibility of the referent. The less accessible the referent becomes, the more likely that the repetition of the noun will be more effective than the pronoun in identifying the referent. If the pronoun is used to refer to a relatively inaccessible referent, then the listener has to search hard before he can identify the referent. This search process takes time. If, on the other hand, the noun is repeated to refer to the referent, then the search process will be facilitated. The repetition of the noun reinstates the referent in the short-term working memory of the listener.

One of the factors which affects the availability of the referent is whether or not there are intervening sentences containing other referents between the first and the second mentions of the referent. Referents whose two mentions are separated by intervening sentences concerned with other referents ([D] referents) are likely to be less accessible than referents whose two mentions are not separated by intervening sentences containing other referents ([C] referents). The results of the present experiment showed that for [D] referents (summing [D1] and [D3] and summing [D5] and [D0]) the noun was reliably faster than the pronoun. The results of the first experiment showed that for [C] referents (when [C5] and [C0] are treated together) the noun and the pronoun were alike. We suggest that the difference between the noun and the pronoun for [D] referents as compared with that between the noun and the pronoun for [C] referents is a reflection of the difference between the cognitive accessibility of [D] and [C] referents.

Because [D] referents are relatively inaccessible, they can not be easily identified by the pronoun.

B. Some evidence to support the view that [D] referents are relatively less accessible than [C] referents comes from examining the results concerning the difference between response time to the question about [B] information and response time to the question about [F] information. These results showed that response time to the question about [B] information was significantly slower than response time to the question about [F] information. We argue that this difference between response time to the question about [B] and [F] information is a reflection of the difference between the cognitive availability of [B] and [F] information. [B] information is relatively less accessible than [F] information. Because of this, the subjects took longer to answer questions about the former than questions about the latter.

Since our formal definition of [D] referents is quite similar to our formal definition of [B] information (one or three intervening sentences containing other referents between the two mentions of the referent; one or three intervening sentences between the critical information and the question) and since our formal definition of [C] referents is quite similar to that of [F] information (no intervening sentences containing other referents between the first and the second mentions of the referent; no intervening sentences containing other information between the critical information and the question), it is highly likely that the status of [D] referents in memory would be similar to the status of [B] information and that the status of [C] referents in memory would be similar to that of [F] information.

If this is so, then the results concerning the difference between the response time to the question for [B] and [F] information could be considered as providing further evidence (though indirect it may be) to support the view that [D] referents are relatively less accessible than [C] referents.

C. Note that what has been said about the difference between [D] and [C] referents applies to both [DS] referents (when [D1] and [D3] are treated together) as opposed to [CS] referents and [DO] referents as opposed to [CO] referents:

1. [DS] referents are relatively less accessible than [CS] referents. The results of the present experiment showed that for [DS] referents the pronoun and the noun were alike. The results of the first and the second experiments showed that for [CS] referents the pronoun was reliably faster than the noun.

2. [DO] referents are relatively less accessible than [CO] referents. The results of the present experiment showed that for [DO] referents (when [D1] and [D3] are treated together) the noun was reliably faster than the pronoun. The results of the first experiment showed that for [CO] referents the noun and the pronoun were alike.

2. A. Another factor which affects the availability of referents in memory is the status of the antecedent noun phrase through which the referent is introduced in the discourse. At issue here is the difference between the cognitive accessibility of displaced subject [DS] and displaced object [DO] referents. Because of their special 'discourse' and/or 'semantic' status, [DS] referents are likely to be more accessible than [DO] referents (by the time the referent is referred to by the anaphor).

The results of the experiment carried out by Sanford and Garrod (1978) seem to support this view. The results of the present experiment give further support to the view that [DS] and [DO] referents do indeed differ in terms of their availability for address in working memory:

1. When [D1] and [D3] referents are treated together and when the pronoun and the noun are treated together, [DS] referents were interpreted faster than [DO] referents.

2. For [DS] referents, the noun and the pronoun were alike whereas for [DO] referents, the noun was reliably faster than the pronoun.

Note that the difference between the noun and the pronoun for [C] referents as opposed to that between the noun and the pronoun for [D] referents is quite similar to the difference between the noun and the pronoun for [DS] referents as opposed to that between the noun and the pronoun for [DO] referents.

[C] referents: the noun and the pronoun were alike. (Exp.1)

[D] referents: the noun was faster than the pronoun. (Exp.3)

[DS] referents: the noun and the pronoun were alike.

[DO] referents: the noun was faster than the pronoun.

If the difference between pronouns and nouns mirrors the difference between the availability of referents in memory, then one is tempted to say that the difference between the availability of [C] and [D] referents is quite similar to the difference between the availability of [DS] and [DO] referents. Note, however, that the difference between the availability of [C] and [D] referents is due to the absence of intervening sentences for [C] referents as opposed to the presence of intervening sentences for [D] referents whereas the difference between the availability of [DS] and [DO] referents is due to the privileged

status of the antecedent noun phrase for [DS] referents as opposed to the less privileged status of the antecedent noun phrase for [DO] referents.

3. When the anaphoric form is the pronoun, [DS] referents were interpreted reliably faster than [DO] referents whereas when the anaphoric form is the noun, there was no reliable difference between the listening time of [DS] and [DO] referents.

Note that the finding that there was no difference between the listening time of [DS] and [DO] referents when the anaphoric form is the noun DOES NOT mean that [DS] and [DO] referents are equally accessible. The important point to be made is that the repetition of the noun, unlike the use of the pronoun, NEUTRALIZES the difference between the cognitive availability of [DS] and [DO] referents. In other words, the noun, unlike the pronoun, is capable of explicitly reinstating [DO] and [DS] referents to the same degree. Some support for this argument comes from a series of experiments performed by Lesgold et al (1979). The results of these experiments showed that backgrounded information (ie relatively inaccessible information) was reinstated (ie brought back to memory) when it was explicitly mentioned again.

B. In the present experiment, the subject and the object nouns were carefully equated in terms of their image-value. Moreover, the intervening sentences in the subject and the object passages were also equated in terms of length, syntactic and semantic difficulty. More importantly, the results of the present experiment showed that there was no reliable difference between the processing time of the intervening sentences in the subject and the object passages.

Thus, the difference between the cognitive availability of [DS] and [DO] referents (as reflected by the results discussed in 2A above) could not be attributed to either inherent differences in image-value among subject and object nouns or to any difference between the amount of processing involved in the interpretation of the intervening sentences in the subject and the object passages. Rather, this difference between the cognitive accessibility of [DS] and [DO] referents is most likely to be due to either the difference between the 'discourse' status of the subject and the object nouns (ie subjecthood v. objecthood) or to the difference between the 'discourse' and the 'semantic' statuses of the subject and the object nouns (ie subjecthood/+agenthood v. objecthood/-agenthood) or simply to the difference between the 'semantic' status of the subject and the object nouns (ie + agenthood v. - agenthood).

C. It is of interest to observe that, when the anaphoric form is the pronoun, the subject's referent was interpreted faster than the object's referent only when the two mentions of the referent are separated by intervening sentences in which the referent is NOT mentioned (ie. [DS] faster than [DO]: anaphoric form pronoun). When there are no intervening sentences containing other referents or when there are intervening sentences in which the referent IS mentioned, there was no reliable difference between the listening time of the subject's and the object's referent (ie. no difference between [CS] and [CO] referents when [C0], [C1], and [C2] are treated together: anaphoric form pronoun). These results suggest that [CS] and [CO] referents, unlike [DS] and [DO] referents, do not significantly differ in terms of their cognitive accessibility. As had been mentioned in chapter 5, the difference between the pronoun and the noun for [CS] referents as opposed to that between the pronoun and the noun for [CO] referents and the difference between [CS] and [CO] referents when the anaphoric form is the noun are most likely to be due to the difference between the 'thematic' functions of pronouns and nouns for [CS] referents as

opposed to [CO] referents. On the other hand, it seems that the difference between the pronoun and the noun for [DS] referents as opposed to that between the pronoun and the noun for [DO] referents and the difference between [DS] and [DO] referents when the anaphoric form is the pronoun are most likely to be due to the difference between the cognitive accessibility of [DS] and [DO] referents.

D. It is also of interest to observe that, when the anaphoric form is the noun, [CO] referents were faster than [CS] referents (Exp.1) whereas [DO] and [DS] were alike (Exp.3). The repetition of the noun for [CO] referents is justifiable on thematic grounds. The repetition of the noun for [CS] referents produces a marked version of message organization (see previous experiment: chapter 6). On the other hand, and for psychological reasons (ie-the effect of intervening sentences on the availability of the referent), the noun may be repeated to refer back not only to [DO] referents but also to [DS] referents. To repeat the noun to refer back to a [DS] referent could hardly be considered as markedness in message organisation.

E. So far we have concerned ourselves with the differences between [DS] and [DO] referents. In order to find out whether or not these differences apply to both [D1S] as opposed to [D1O] referents and to [D3S] as opposed to [D3O], we have broken up the antecedent and anaphoric form interaction into two parts:

1. Antecedent and anaphoric form interaction (at +1): sub-plan 5.
2. Antecedent and anaphoric form interaction (at +3): sub-plan 6.

The results of sub-plan 5 showed that there was no reliable interaction between the antecedent and the anaphoric form (at +1): the differences between [D1S] and [D1O] referents (which were the same as those between [DS] and [DO] referents) could be attributed to chance.

What these results suggest, then, is that not only there is no significant difference between the cognitive accessibility of [CS] and [CO] referents but also there is no significant difference between the cognitive accessibility of [D1S] and [D1O] referents. In short, one intervening sentence in which the referent is not mentioned is not enough to make the object's referent significantly less accessible than the subject's referent.

On the other hand, the results of sub-plan 6 showed that the antecedent and anaphoric form interaction (at +3) was highly reliable and by all measures. The meaning of this interaction could be stated once more as follows:

1. For [D3S], the pronoun and the noun were alike whereas for [D3O], the noun was significantly faster than the pronoun.
2. When the anaphoric form is the pronoun, [D3S] were significantly faster than [D3O] whereas when the anaphoric form is the noun, [D3S] and [D3O] were alike.

What the results of sub-plan 6 suggest, then, is that [D3O] referents were significantly less accessible than [D3S] referents. Moreover, these results support one of the major points we have made in chapter 2. In that chapter, we have argued that the object's referent would be no longer foregrounded at an earlier point in the discourse than the subject's referent. Consequently, the point at which the repeated noun will be superior to the pronoun would come earlier in the discourse when the referent is object than when it is subject. As the results of sub-plan 6 showed, the noun was faster than the pronoun for the object's referent whereas the noun and the pronoun were alike for the subject's referent.

3. A. Contrary to our expectations and to the results of the experiment carried out by Sanford and Garrod (1978), the results of the present experiment showed no reliable difference between the listening time of [D1] and [D3] referents (when the pronoun and the noun are treated together and when [D S] and [D O] referents are treated together). These results suggest that there is no significant difference between the cognitive accessibility of [D1] and [D3] referents. The results concerning the difference between the pronoun and the noun for [D1] referents as opposed to the difference between the pronoun and the noun for [D3] referents and the results concerning the difference between the response time to the question for [B1] and [B3] information seem to support the view that [D1] and [D3] referents do not significantly differ in terms of their cognitive availability. Below, we will take each of these results in turn.

1. P v. N [D1] V. P v. N [D3]:

The results of the present experiment showed that the difference between the pronoun and the noun for [D1] referents did not differ significantly from the difference between the pronoun and the noun for [D3] referents (ie the Distance and Anaphoric form interaction was not reliable). If, as we have been arguing, the difference between pronouns and nouns mirrors the difference between the cognitive accessibility of referents, and if the difference between the pronoun and the noun for [D1] referents was found to be similar to that between the pronoun and the noun for [D3] referents then the implication is that [D1] and [D3] referents do not differ in terms of their cognitive accessibility.

2. [B1] V. [B3]: analysis 2, sub-section 7.7.2:

The results of this analysis showed that there was no reliable difference between response time to the question about [B1] and [B3] information.

Since our formal definition of [D1] referents is quite similar to our formal definition of [B1] information (one intervening sentence containing other referents between the mentions of the referent; one intervening sentence between the critical information and the question) and since our formal definition of [D3] referents is quite similar to that of [B3] information (three intervening sentences containing other referents between the two mentions of the referent; three intervening sentences between the critical information and the question), it is highly likely that the status of [D1] referents in memory would be similar to that of [B1]information and that the status of [D3] referents in memory would be similar to that of [B3] information. If this is so, then the finding that there was no significant difference between response time to the question about [B1] and [B3] information could be considered as further evidence to support the view that [D1] and [D3] referents do not differ in terms of their cognitive accessibility.

B. Further evidence to support the results presented in A 2. above was reported by Lesgold et al (1979) and Clark and Sengul (1979):

1. Lesgold et al (1979)

Lesgold et al identified 3 foregrounded (F) conditions and 3 backgrounded (B) conditions. The three (F) conditions were formally defined as follows:

F-0: no intervening sentences between the context and the target sentences. Note that the formal definition of F0- information is similar to our formal definition of (F) information and to our formal definition of [Cϕ] referents.

F-2: two intervening sentences in which the critical information was also mentioned. Note that this formal definition of F-2 information is similar to our formal definition of [C2] referents.

F-4: four intervening sentences in which the critical information was also mentioned.

The three (B) conditions were formally defined as follows:

B-2: two intervening sentences which did not mention the critical information.

B-4: four intervening sentences which did not mention the critical information.

Note that the number of the intervening sentences in the B-4 condition exceeds the number of the intervening sentences in the B-2 condition by 2 sentences and that the number of the intervening sentences in our [B3] condition exceeds the number of the intervening sentences in our [B1] condition by 2 sentences.

B-22: four intervening sentences which dealt with two topics which were irrelevant to the critical information. The intervening sentences in the B-2 and the B-4 conditions dealt with one topic which was irrelevant to the critical information.

The results of the experiment showed that the three foregrounding (F) conditions were significantly faster than the three backgrounding (B) conditions. These results are quite similar to those obtained from our experiment: response time to the question about [F] information was significantly faster than response time to the question about [B] information. Within the (F) conditions, there were no significant pairwise differences. These results are similar to those obtained from our experiment: there was no significant difference between the listening time of [C0], [C1] and [C2] referents.

More importantly, the results of the experiment performed by Lesgold et al showed no pairwise significant differences within the (B) conditions. Thus, there was no significant difference between B-2 and B-4 conditions. These results are quite similar to those obtained from our experiment: no significant difference between [B1] and [B3] conditions.

2. Clark and Sengal (1979):

Clark and Sengul presented their subjects with a number of three-sentence context paragraphs. Each paragraph was followed by a target sentence. The target sentence contained either a noun or pronoun whose referent had been mentioned in sentence 1,2, or 3 of the context paragraph. The first mention of the referent was always indefinite.

Note that the referents which were mentioned in sentence 3 of the context paragraph are, in our terminology [C] referents (no intervening sentences containing other referents between the two mentions of the referent). On the other hand, the referents which were mentioned in sentence 2 or 1 of the context paragraph are, in our terminology, [D] referents (intervening sentences containing other referents between the two mentions of the referent). Those referents mentioned in sentence 2 are, in our terminology, [D1] referents while those mentioned in sentence 1 could be referred to as [D2] referents (two intervening sentences containing other referents between the antecedent and the anaphor).

The results of Clark and Sengul's experiment showed that the referent was interpreted significantly faster in sentence 3 ([C] referents) than in sentence 1 or 2 ([D] referents).

There was no reliable difference between the listening time for the referent in sentence 2 and sentence 1 (ie - [D1] and [D2] were alike). The pronoun and the noun were alike, with no reliable differences in their means or interactions.

4. The analysis of the response time to the YES/NO questions was meant to support some of the main results of the present experiment. The processes involved in answering YES/NO questions are in themselves worthy of comment. On this issue, Clark and Clark (1977) write:

> When listeners are confronted with a yes/no question, their goal is normally to answer it. They realize that it is a speech act requesting them to provide information about the truth or falsity of one or more propositions. If Ann asks Ed, "Was it JOHN who hit Bill?" he realizes she wants him to affirm or deny that it was John who hit Bill. If Ed is co-operative, he searches memory for who it was that hit Bill. If he finds it was John he replies "Yes," and if he finds it was someone else he replies "No". (P.100)

What Clark and Clark did not mention was the factors which affect the accessibility of the information which the listener has to affirm or deny. Information which immediately precedes the question [F] is likely to be more accessible than information which does not immediately precede the question [B]. Thus, the listener will find easier to affirm or deny [F] information than [B] information. As the results of our experiment showed, questions about [F] information were responded to faster than questions about [B] information.

CHAPTER 8

CONCLUSION

8.0 STRUCTURE OF THE CHAPTER:

This chapter consists of three main sections. In 8.1, we relate the results of the experiments to the views we have expressed in the first two chapters. In 8.2, we discuss the implications of the study for teaching the comprehension of the two anaphoric forms investigated for non-native speakers of English. In 8.3, ideas for further research are suggested.

8.1 THEORETICAL CONTRIBUTIONS OF THE STUDY:

Various scholars (e.g. Halliday and Hasan, 1976) have argued that pronouns are more effective than repeated nouns in identifying for the listener a referent which has been mentioned in the preceding discourse. The pronoun unambiguously refers to the same individual as the antecedent. The repeated noun, on the other hand, may or may not refer to the same individual as the antecedent. Hereafter, we shall refer to this as Theory A.

In chapters 1 and 2, we have argued that Theory A must be modified and expanded when the following three factors are taken into consideration:

1. The 'Communicative principles' shared by the speaker and the listener in actual communicative situations.
2. The distance between the first and the second mentions of the referent.
3. The status of the antecedent noun phrase through which the first mention of the referent is made.

In the rest of this section we will examine the evidence which seems to support the argument we have advocated in the first two chapters.

1. Pronouns V. Repeated nouns: Communicative principles

A. The results of the first experiment showed that (in cases such as 1 below) the subjects (native speakers) interpreted the referent faster when the second mention of the referent was made by the pronominal form of the antecedent noun phrase (e.g. Mike ---- he) than when it was made by the repetition of that noun phrase (e.g. Mike --- Mike):

1. Mike lost the match. a. He/b. Mike felt very miserable.

Theory A would explain these results by arguing that He unambiguously refers to the same individual referred to by the first Mike whereas the second Mike is ambiguous between referring to the same individual as the first Mike and referring to a different individual who is also called Mike. To test this explanation, the second experiment was carried out. In this experiment, the subjects (native speakers) were presented with sentences in which both the pronoun and the noun unambiguously identify the referent for the listener. Consider 2 below:

2. Churchill led Britain to victory in the second war.

a. He/ b. Churchill died in 1965.

In cases such as 2 above it could not reasonably be argued that the second noun is ambiguous between referring to the same individual as the first noun and referring to a different individual. Thus, in 2 above both He and the second Churchill unambiguously identify the referent "Churchill" for the listener. Nevertheless, and as the results of Experiment 2 showed, the pronoun was faster than the noun even in cases such as 2 above.

These results do not support the explanation offered for the results of Experiment 1 by Theory A. Otherwise there should have been no difference between the listening time of the pronoun and the listening time of the noun in Experiment 2.

As we have argued before, Theory A underlying this explanation, does not take account of two communicative principles which we think have an important role to play in considering the difference between the pronouns and repeated nouns in cases such as 1 and 2 above. The first of these principles (i.e. the co-operative principle) refutes this explanation. On the basis of this principle, we have argued that the listener will understand that the same individual is being referred to even if the noun is repeated rather than pronominalized in cases such as 1 and 2 above. On the basis of the second principle (a message organization principle), we offered an alternative explanation which seems to account for the results of both Experiments 1 and 2. In cases such as 1 and 2 above, the listener expects the reference to be made by the pronoun and not by the repetition of the noun. Because of this, the referent (in cases such as 1 and 2 above) was interpreted faster when the noun is pronominalized than when it is repeated.

B. In addition to rejecting one of the basic claims made by Theory A, the results of Experiment 2 suggested that comprehension is not only content-governed. In other words, sentences which convey the same 'content' may not necessarily be equally comprehensible. The way in which one and the same 'content' is packaged to the listener may be an important factor in comprehension.

The pronoun and the noun target sentences in Experiment 2 have the same content. Nevertheless, the subjects took longer to indicate that they have understood the latter than the former.

2. Pronouns v. Repeated nouns: the distance between the two mentions of the referent.

A. P v. N ([C] referents) V. P v. N ([D] referents):

One limitation of Theory A is that it does not take into account some psychological considerations which are likely to affect the difference between pronouns and repeated nouns. Such considerations include the difference between the cognitive accessibility of referents in memory and the effect this might have on the difference between pronouns and repeated nouns. We have argued that if the referent is not readily accessible, then the noun will be more effective than the pronoun in identifying the referent for the listener.

On the basis of the distance factor, we have distinguished between two major types of referents:

(i) [C] referents: no intervening sentences containing other referents between the two mentions of the referent.

(ii) [D] referents: intervening sentences between the two mentions of the referent.

It was argued that [D] referents (summing [D1] and [D3] and summing [D5] and [D0]) are likely to be less accessible than [C] referents (when [C5] and [C0] are treated together). On the basis of this argument, we predicted that the noun will be more effective than the pronoun in identifying [D] referents whereas the pronoun may be as effective as the noun in identifying [C] referents.

The results of Experiments 1 and 3 seem to support this prediction and the argument underlying it:

(i) For [C] referents (summing [CS] and [CO]), the pronoun and the noun were alike (Exp.1). For [D] referents, the referent was interpreted faster when the second mention of the referent is made by the repetition of the noun than when it is made by the pronoun (Exp.3).

(ii) The analysis of the response time to the question in Experiment 3, seems to support the argument that [D] referents are less accessible than [C] referents. Response time to the question about [B] information (which was defined in the same way as [D] referents) was significantly slower than response time to the question about [F] information (which was defined in the same way as [C] referents).

B. P v. N [D1] referents V. P v. N [D3] referents:

[D] referents were classified into:

(i) [D1] referents: one intervening sentence containing other referents.

(ii) [D3] referents: three intervening sentences containing other referents.

It was argued that [D3] referents are likely to be less accessible than [D1] referents. Hence, it was predicted that [D1] referents will be interpreted faster than [D3] referents and that, although the noun may be faster than the pronoun for both types of referents, it will be much more faster than the pronoun for [D3] referents than for [D1] referents.

The results of Experiment 3 do not support these predictions:

(i) There was no difference between the listening time of [D1] and the listening time of [D3] referents.

(ii) The difference between the listening time of the pronoun and the listening time of the noun for [D1] referents was parallel to that between the listening time of the pronoun and the listening time of the noun for [D3] referents.

(iii) There was no reliable difference between response time to the question about [B1] information (which was defined in the same way as [D1] referents) and response time to the question about [B3] information (which was defined in the same way as [D3] referents).

In summary, distance seems to have a role to play but only when it is considered as a contrast between + no intervening sentences ([C] referents) and + intervening sentences concerned with other referents ([D] referents). Distance as a contrast between + one intervening sentence containing other referents ([D1] referents) and + three intervening sentences containing other referents ([D3] referents) does not seem to have an effect.

3. Pronouns v. Repeated nouns: The status of the antecedent:

Another shortcoming of Theory A is that it does not take into consideration the status of the antecedent noun phrase through which the first mention of the referent is made and the effect this is likely to have on the difference between pronouns and repeated nouns. On the basis of this third factor, we distinguished between two major types of referents:

(i) Subject [S] referents: first mention of the referent made by a subject noun phrase.

(ii) Object [O] referents: first mention of the referent made by an object noun phrase.

By combining this classification with that based on the distance factor we have:

(i) [CS] v. [CO]

(ii) [DS] v. [DO]

The results of Experiments 1 and 3 support the argument that the difference between pronouns and repeated nouns IS affected by whether the referent is subject or object and that the difference between subject and object referents IS affected by whether the anaphoric form is the pronoun or the noun. These results are briefly discussed below.

A. [CS] referents v. [CO] referents: Experiment 1

(i) For [CS] referents, the pronoun was reliably faster than the noun whereas for [CO] referents, the pronoun and the noun were alike.

(ii) When the anaphoric form is the pronoun, there was no difference between the listening time of [CS] and [CO] referents whereas when the anaphoric form is the noun, [CO] referents were interpreted faster than [CS] referents.

We have suggested that these results are most likely to be due to the difference between the 'thematic' functions of pronouns and repeated nouns for [CS] referents as opposed to [CO] referents. Consider 3 and 4 below:

3. The bull chased the farmer. a. It/b. The bull was furious.

4. The woman fed the cat. a. It/b. The cat was hungry.

There is more reason to repeat the noun in 4 than there is to repeat the noun in 3. The repetition of the noun in 4 conveys the thematic function "the referent 'the cat' which has been introduced as surface object is reintroduced as surface subject". The referent in 3, on the other hand, has already been introduced as surface subject. The repetition of the noun in this case produces a marked version of message organization.

B. [DS] referents v. [DO] referents: Experiment 3

(i) For [DS] referents, the pronoun and the noun were alike whereas for [DO] referents, the noun was faster than the pronoun.

(ii) When the anaphoric form is the pronoun, [DS] referents were interpreted faster than [DO] referents whereas when the anaphoric form is the noun, there was no difference between the listening time of [DS] and [DO] referents.

We suggested that the results in (i) are most likely to be due to the difference between the cognitive availability of [DS] and [DO] referents. Because of their special status, [DS] referents are likely to be relatively more accessible than [DO] referents by the time the second mention of the referent is made. Hence, [DS] referents can be addressed by either the pronoun or the noun. On the other hand, [DO] referents are more easily addressed by the noun than by the pronoun.

To explain the results in (ii) we argued that these results are most likely to be due to the difference between the psychological properties of pronouns and the psychological properties of nouns. The repetition of the noun neutralizes the difference between the cognitive accessibility of [DS] and [DO] referents. The use of the pronoun, on the other hand, EXPOSES the difference between the cognitive accessibility of [DS] and [DO] referents.

To sum up the discussion in this section, the results of this study seem to give general support to the claim that:

In considering the difference in effectiveness between pronouns and nouns the communicative principles shared by the listener and the speaker in actual communicative situations, the distance between the two mentions of the referent, and the status of the antecedent have to be taken into account.

8.2 IMPLICATIONS FOR TEACHING NON-NATIVE SPEAKERS:

A. The results of Experiment 1 showed that when [CS] and [CO] are taken together, the pronoun and the noun were alike for the native speakers whereas the noun was faster than the pronoun for the non-native speakers. Further analysis of these results showed that, when the referent is [CO], the non-native speakers' performance did not differ from that of the native speakers. It is when the referent is [CS] that the non-native speakers' performance differed from that of the native speakers:

When the referent is [CS], the pronoun was faster than the noun for the native speakers whereas the noun was faster than the pronoun for the non-native speakers.

These results suggest that the non-native speakers' understanding of the function of anaphoric pronouns (as used to refer to [CS] referents) is incompletely developed. This may be due, in part, to the following reasons:

(i) Many of the textbooks written for non-native speakers emphasise the form at the expense of the function of anaphoric pronouns. Consider 1 and 2 below which are taken from a textbook for teaching English to Iraqi learners:

5. He's studying English now.

6. He's studying Arabic now.

It may be that these examples are meant to teach the present continuous tense. Nevertheless, it would have been more fruitful if some linguistic or non-linguistic context is provided so that the learner may be given a chance to relate he to a possible antecedent. With no context provided, the learner is exposed only to the form of the pronoun. If, on the other hand, a sentence like John went to his room an hour ago is added to 5 and 6 above, the learner will be exposed to both the function and the form of the pronoun.

(ii) Even if some textbooks contain materials in which some context is provided, it is rarely the case that the learner is explicitly made aware of the function of anaphoric pronouns. Thus, it is not simply a matter of providing antecedents for pronouns. It is important that the learner be made explicitly aware of the relationship between the pronouns and their antecedents. This may involve not only giving the learner some idea about the use of pronouns and anaphoric nouns in English but also drawing the learner's attention to the difference and similarities between English and the native language as far as the use of these anaphoric forms is concerned.

B. Teaching programmes based on the theory criticized in this thesis would emphasize to the learner of English the mistaken view that repeated nouns, unlike pronouns, are ambiguous between referring to the intended referent and referring to a different referent. Such emphasis would only be valid if the object of language teaching is to teach language forms with no reference to the communicative situations in which these forms are used.

As the results of Experiment 2 showed, it is the 'communicative rules' rather than the 'structural rules' which determine the use of pronouns as opposed to the use of nouns to refer back to [CS] referents. The implication to be drawn from these results is that what should be emphasised to the learner is not so much the rules of 'usage' but rather the rules of 'use'.

C. Teaching comprehension to non-native speakers of English has nearly always concentrated on teaching 'content' to the exclusion of teaching the way in which 'content' is transmitted. The assumption being made is that the way in which 'content' is packaged does not play a significant role in comprehension. As the results of Experiment 2 showed, comprehensibility varies with variation in the way one and the same 'content' is packaged. The implication to be drawn from these results is that teaching comprehension to non-native speakers of English should not only concentrate on teaching 'content' but also on teaching the different realization forms and the different contexts (linguistic and non-linguistic) in which these forms are used to convey the same 'content'.

8.3 IDEAS FOR FURTHER EXPERIMENTS:

A. The results of Experiment 3 showed that the difference between pronouns and nouns is affected by whether the referent is [DS] or [DO]. We explained these results in terms of the difference between the cognitive accessibility of [DS] and [DO] referents. The claim being often made in the literature is that [DS] referents are more accessible than [DO] referents because the former have the privileged 'discourse' status "subjecthood" whereas the latter have the less privileged 'discourse' status "objecthood".

As we have argued before, [DS] referents have also the privileged 'semantic' status "+Agenthood" whereas [DO] referents have also the less privileged 'semantic' status "-Agenthood". Thus, it is not clear whether the difference between the cognitive availability of [DS] and [DO] referents is due to the contrast "subjecthood" versus "objecthood" or to the contrast "+Agenthood" versus "-Agenthood". One way of settling this issue is to perform an experiment which differs from Experiment 3 in that the first sentence in each of the experimental passages is passive rather than active. In such an experiment, the surface subject's referent would have the statuses "subjecthood" and "-Agenthood" whereas the surface object's referent would have the statuses "objecthood" and "+Agenthood". If the differential factor is the 'discourse' status of the antecedent (ie. "subjecthood" v. "objecthood"), then the results of such an experiment should be similar to those of Experiment 3. If, on the other hand, the differential factor is the 'semantic' status of the antecedent (ie "+Agenthood" v. "-Agenthood"), then the results of such an experiment should be opposite to those of Experiment 3.

B. Another factor which may affect the availability of referents in memory is the image-value of the antecedent nouns. It would be of interest if an experiment is performed in which the subject nouns have a low image-value whereas the object nouns have a high image-value. If differences in image value have a decisive role to play, then the results of such an experiment should be opposite to those of Experiment 3. If, on the other hand, what matters is the 'discourse' and/or the 'semantic' status (es) of the antecedent, then the results of such an experiment should be similar to those of Experiment 3.

C. Various other experiments could be performed to support the finding that the way in which one and the same message is packaged may effect comprehension. Consider 7 below (Halliday and Hasan, 1976):

7. I lost my way in the galleries.

a. The same thing happened to me. TARGET

b. I also lost my way in the galleries. TARGET

Like the sentences used in Experiment 2, sentences 7a and 7b convey the same message. However, it seems that the message is more appropriately packaged by 7a than by 7b. On the basis of this, one would expect listeners to process 7a more quickly than 7b.

D. One other interesting idea for further experimentation is to compare reaction time to anaphoric forms which identify the referent for the listener with the reaction time to anaphoric forms which, in addition to identifying the referent, also communicate to the listener the speaker's attitude towards the referent. Consider 8 below:

8. Speaker A: Mrs. Thatcher promised to help the unemployed.

Speaker B: Thatcher will do nothing about unemployment. TARGET

Speaker C: She will do something. TARGET

More processes are involved in the comprehension of B's utterance than in the comprehension of the second utterance of A. In the case of Thatcher, the listener's job is not only to identify the intended referent but also to understand the 'communicative' meaning conveyed by the use of the expresseion. Hence one would expect B's utterance to take longer to understand than A's second utterance (assuming that differences in length, syntactic and semantic difficulty do not significantly affect the comprehension of the utterances).

E. In Experiment 1 we compared the native and the non-native speakers' comprehension of anaphoric nouns and pronouns. It may also be of interest to compare the native and the non-native speakers' use of these two anaphoric forms. On the basis of the results of Experiment 1, one would expect the non-native speakers to repeat rather than pronominalize the noun in situations where the native speakers might do the opposite.

BIBLIOGRAPHY

The Bibliography contains works which are mentioned in the body of the thesis as well as works relating to the broader issues underlying the thesis topic.

Al. Hamash, K., & Hammo, B. The New English Course for Iraq: Book II. Baghdad, 1974.

Anderson, B. The Short-term retention of active and passive sentences. Unpublished doctoral dissertation, John Hopkins University, 1963.

Anderson, J. R., & Hastie, R. Individuation and reference in memory: Proper names and definite descriptions. Cognitive Psychology, 1974, 6, 495 - 514.

Austin, J. L. How to do things with words. Oxford: Oxford University Press, 1962.

Barnitz, J. G. Children's development of syntactic aspects of reading comprehension: Pronoun-referent structures. Unpublished doctoral dissertation, University of Illinois, 1978.

Bloomfield, L. Language. New York: Holt, Rinehart & Winston, 1933.

Bolinger, D. 'Pronouns and repeated nouns'. Bloomington, Indiana: Indiana University Linguistics Club, 1977.

Bolinger, D. Pronouns in discourse. In Givón, T. (Ed.), Syntax and Semantics, Vol. 12: Discourse and Syntax. New York: Academic Press, 1979, pp. 289 - 308.

Bransford, J. D., & Johnson, M. K. Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 717 - 726.

Brown, G. Listening to Spoken English. Longman, 1977.

Caramazza, A., Grober, E. H., Garvey, C., & Yates, J. Comprehension of anaphoric pronouns. Journal of Verbal Learning and Verbal Behavior, 1977, 16, 601 - 609.

Chafe, W. L. Meaning and the Structure of Language. Chicago: University of Chicago Press, 1970.

Chafe, W. L. Discourse Structure and Human Knowledge. In J.B. Carrol & R. O. Freedle (Eds.), Language Comprehension and the Acquisition of Knowledge. Washington, D. C.: V. H. Winston & Sons, 1972, pp. 41 - 69.

Chafe, W. L. Language and Memory. Language, 49, 1973.

Chafe, W. L. Language and Consciousness. Language, 50, 1974, 111 - 133.

Chafe, W. L. Giveness, Contrastiveness, definiteness, subjects, topics, and point of view. In C. N. Li (Ed.), Subject and Topic. New York: Academic Press, 1976, pp 25 - 55.

Chang, F. R. Active memory processes in visual sentence comprehension: Clause effects and pronominal reference. Memory and Cognition, 1980, Vol. 8 (1), 58 - 64.

Chomsky, N. Aspects of the Theory of Syntax. Cambridge, MA: M.I.T. Press, 1965.

Cicourel, A.V. Cognitive Sociology. Penguin, 1973.

Clark, H. H. Some structural properties of simple active and passive sentences. Journal of Verbal Learning and Verbal Behavior, 4, 1965, 365 - 370.

Clark, H. H. The Prediction of recall patterns in simple active sentences. Journal of Verbal Learning and Verbal Behavior, 5, 1966, 99 - 106.

Clark, H. H. The language-as-fixed-effect fallacy: A Critique of language statistics in psychological research. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 335 - 359.

Clark, H. H. Discussion of Wike and Church's comments. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 257 - 266.

Clark, H. H. Bridging. In P.H. Johnson-Laird & P.C. Wason (Eds.), Thinking: Readings in cognitive science. Cambridge: Cambridge University Press, 1977, pp. 411 - 420.

Clark, H. H. Responding to Indirect speech acts. Cognitive Psychology, 1979, 11, 430 - 477.

Clark, H. H., & Begun, J. S. The use of syntax in understanding sentences. British Journal of Psychology, 1968, 59, 219 - 229.

Clark, H. H. & Card, S. K. The role of semantics in remembering comparative sentences. Journal of Experimental Psychology, 1969, 82, 545 - 552.

Clark, H. & Clark, E. Psychology and Language. New York: Harcourt, Brace Jovanovivh, 1977.

Clark, H. H. & Haviland, S. E. Comprehension and the given-new contract. In R. O. Freedle (Ed.), Discourse production and comprehension. Norwood, N.J.: Ablex Publishing, 1977, pp. 1 - 40.

Clark, H. H., & Sengul, C. J. In search of referents for nouns and pronouns. Memory and Cognition, 1979, 7, 35 - 41.

Cohen, J. Discussion of Wike and Church's comments. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 261 - 262.

Coleman, E. B. Generalizing to a language population. Psychological Reports, 1964, 14, 219 - 226.

Coleman, E. B. Learning of prose written in four grammatical transformations. Journal of Applied Psychology, 1965, 49, 332 -341.

Coleman, E. B. Generalization effects vs Random effects: Is σ^2_{TL} a source of Type 1 or Type 2 error? Journal of Verbal Learning and Verbal Behavior, 1979, 18, 243 - 256.

Cornfield, J., & Tukey, J. W. Average values of means squares for factorials. Annals of Mathematical Statistics, 1956, 27, 907 - 948.

Crymes, R. Some systems of substitution correlations in modern American English, The Hague: Mouton, 1968.

Daneš, F. (Ed.). Papers on functional sentence perspective. The Hague: Mouton, 1974.

Dutka, J. Y. Anaphoric nominal substitution and relationship to reading comprehension among College students. Unpublished Doctor of Education dissertation, Columbia University Teachers College, 1978.

Edwards. A. L. Experimental design in psychological research. New York: Holt, Rinehart & Winston, 1972. 4th ed.

Ehrlich, K. Comprehension of pronouns. Quarterly Journal of Experimental Psychology, 1980, 32, 247 - 255.

Fillmore, C. J. The Case for case. In E. Bach & R. T. Harms (Eds.), Universals of linguistic theory. New York: Holt, Rinehart & Winston, 1968, pp. 1 -90.

Firbas, J. Some aspects of the Czechoslovak approach to problems of functional sentence perspective. In Daneš, F. (Ed.), Papers on functional sentence perspective, The Hague: Mouton, 1974.

Fishman, A. S. Elements of cohesion: The effect of noun phrase organizers and anaphoric references on paragraph comprehension. Unpublished doctoral dissertation, Northwestern University, 1977.

Forster, K. I. & Dickinson, R. G. More on the language-as-fixed-effect fallacy: Monte Carlo estimates of error rates for F2, F', and min F'. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 135 - 142.

Freedle, R. O. (Ed.). Discourse production and comprehension. Hillsdale, N. J. : Lawrence Erlbaum associates, 1977.

Freedle, R. O. & Carrol, J. B. (Eds.). Language comprehension and the acquistion of knowledge. Washington, D. C. V. H. Winston and Sons, 1972.

Garrod, S. & Sanford, A. J. Interpreting anaphoric relations: the integration of semantic information while reading. Journal of Verbal Learning and Verbal Behavior, 1977, 16, 77 - 90.

Garvey, C., Caramazza, A., & Yates, J. Factors influencing assignment of pronoun antecedents. Cognition, 1974 - 75, 3, 227 - 243.

Geach, P. T. Reference and generality. Ithaca, N.Y.: Cornell University Press, 1962.

Gibbs, R. W. Your wish is my command: convention and context in interpreting indirect requests. Journal of Verbal Learning and Verbal Behavior, 1981, 20, 431 - 444.

Goody, E. N. (Ed.). Questions and politeness. Cambridge: Cambridge University Press, 1978.

Grice, H. P. William James Lectures, Harvard University, 1967. Published in part as "Logic and conversation". In P. Cole & J. L. Morgan (Eds.), Syntax and semantics, Vol. 3: Speech acts. New York, Seminar Press, 1975, pp. 41 - 58.

Grimes, J. The thread of discourse. The Hague: Mouton, 1975.

Grober, E. H., Beadsley, W. & Caramazza, A. Parallel function strategy in pronoun assignment. Cognition, 1978, 6, 117 - 133.

Haber, A., & Runyon, R. P. General statistics. London: Addison - Wesley Publishing Company, 1973.

Haberlandt, K., & Bingham, G. Verbs contribute to the coherence of brief narratives: Reading related and unrelated sentence triples. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 419 - 425.

Hall, B. The transitive verb in English. Unpublished Ph. D dissertation, M.I.T., 1965.

Halliday, M. A. K. Notes on transitivity and theme in English: II Journal of Linguistics, 1967, 3, 199 - 244.

Halliday, M. A. K. Language structure and language function. In J. Lyons (Ed.), New horisons in linguistics, Baltimore: Penguin Books, 1970, pp. 140 - 165.

Halliday, M. A. K. Exploratins in the functions of language. London: Edward Arnold, 1973.

Halliday, M. A. K., & Hasan, R. Cohesion in English. London: Longman, 1976.

Haviland, S. E. & Clark, H. H. What's new? Acquiring new information as a process in comprehension. Journal of Verbal Learning and Verbal Behavior, 1974, 13, 512 - 521.

Hays, W. L. Statistics. New York: Holt, Rinehart & Winston, 1963.

Hirst, W., & Brill, G. A. Contextual aspects of pronoun assignment. Journal of Verbal Learning and Verbal Behavior, 1980, 19, 168 - 175.

Hornby, P. A. Surface structure and presupposition. Journal of Verbal Learning and Verbal Behavior, 1974, 13, 530 - 538.

Horowitz, L. M., & Prytulak, L. S. Redintegrative memory. Psychological Review, 1969, 76, 519 - 531.

Hudson, R. A. Sociolinguistics. Cambridge: Cambridge University Press, 1980.

Hupet, M., & Bouedec, B. L. The given-new contract and the constructive aspect of memory for ideas. Journal of Verbal Learning and Verbal Behavior, 1977, 16, 69 - 75.

Huttenlocher, J., Esienberg, K., & Strauss, S. Comprehension: Relation between perceived actor and logical subject. Journal of Verbal Learning and Verbal Behavior, 1968, 7, 300 - 304.

Hymes, D. On communicative competence. In J. B. Pride, & J. Holmes (Eds.), Sociolinguistics. Penguin, 1972.

James, C. T. Theme and imagery in recall of active and passive sentences. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 205 - 211.

Jennrich, R., & Sampson, P. General mixed model analysis of variance-equall cell sizes. In BioMedical Computer Programs - BMDP - 8V, University of California, 1979.

Johnson, M. G. Syntactic position and rated meaning. Journal of Verbal Learning and Verbal Behavior, 1967, 6, 240 - 246.

Johnson-Laird, P. N. The choice of the passive voice in a communicative task. British Journal of Psychology, 1968, 59, 7 - 15 (a).

Johnson-Laird, P. N. The interpretation of the passive voice. Quarterly Journal of Experimental Psychology, 1968, 20, 69 - 73 (b).

Keenan, E. L. Anaphora and cross referencing systems. Paper at Typology and Field Work Workshop, Oswego, New York, 1976.

Keith-Smith, J. E. Discussion of Wike and Church's comments. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 262 - 263.

Keppel, G. Design and analysis: A researcher's handbook. Englewood Cliffs, New Jersey: Prentice-Hall, 1973.

Keppel, G. Discussion of Wike and Church's comments. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 263 - 266.

Kirk, R. E. Experimental design: Procedure for the behavioral sciences. Belmont, California: Brooks/Cole, 1969.

Lakoff, G. Pronouns and reference. In J. D. McCawley (Ed.), Notes from the linguistic underground. New York: Academic Press, 1976, pp. 275 - 336.

Leech, G. Semantics. Baltimore: Penguin Books, 1974.

Lesgold, A. M. Pronominalization: A device for unifying sentences in memory. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 316 - 323 (a).

Lesgold, A. M. Effects of pronouns on children's memory for sentences. Pittsburgh: Pittsburgh University, Learning Research and Development Center, 1972. (ERIC Document Reproduction Service NO. ED 068 974) (b).

Lesgold, A. M., Roth, S. F., & Curtis, M. E. Foregrounding effects in discourse comprehension. Journal of Verbal Learning and Verbal Behavior, 1979, 18, 291 - 308.

Li, C. N. (Ed.). Subject and topic. New York: Academic Press, 1976.

Lyons, J. (Ed.). New horizons in linguistics. Harmondsworth: Penguin Books, 1970.

Lyons, J. Semantics (2 vols.). Cambridge: Cambridge University Press, 1977.

Meyers, L. S., & Grossen, N. E. Behavioral research: Theory, procedure, and design. San Francisco: W. H. Freeman and Company, 1974.

McKoon, G., & Ratcliff, R. The comprehension processes and memory structures involved in anaphoric reference. Journal of Verbal Learning and Verbal Behavior, 1980, 19, 668 - 682.

McNemar, Q. Psychological statistics. New York: Wiley, 1969, 4th ed.

Nyyssönen, H. Towards a pedagogically relevant model of discourse analysis. Doctoral dissertation, University of Edinburgh, 1976.

Paivio, A. Mental imagery in associative learning and memory. Psychological Review, 1969, 76, 241 - 263.

Paivio, A., Yuille, J., & Madigan, S. Concreteness, imagery, and meaningfulness value for 925 nouns. Journal of Experimental Psychology, 1968, 76, Monograph supplement, No. 1, Part 2.

Perfetti, C, A., & Goldman, S. R. Thematization and sentence retrieval. Journal of Verbal Learning and Verbal Behavior, 1974, 13, 70 - 79.

Prentice, J. L. Response strength of single words as an influence in sentence behavior. Journal of Verbal Learning and Verbal Behavior, 1966, 5, 429 - 433.

Reinhart, T. The syntactic domain of anaphor. Unpublished doctoral dissertation, MIT, 1976.

Richek, M. A. Reading comprehension of anaphoric forms in varying linguistic contexts. Reading Research Quarterly, 1976 - 77, 2, 145 - 164.

Rochester, S. R., & Martin, J. R. The art of referring: The speaker's use of noun phrases to instruct the listener. In R. O. Freedle (Ed.), Discourse production and comprehension. Hillsdale, N. J.: Lawrence Erlbaum associates, pp. 245 - 269.

Sanford, A. J., & Garrod, S. Memory and attention in text comprehension: the problem of reference. Paper presented at the 8th International Attention and Performance Conference. Princeton, N. J., 1978. Published in R. S. Nickerson (Ed.), Attention and performance VIII. Hillsdale, N. J.: 1980.

Searle, J. R. Speech acts. Cambridge: Cambridge University Press, 1969.

Searle, J. R. Indirect speech acts. In P. Cole & J. L. Morgan (Eds.), Syntax and semantics, Vol. 3: Speech acts. New York: Seminar Press, 1975, pp. 59 - 82.

Simukoko, Y. T. Some aspects of the English of Bantu speakers in urban primary schools in Zambia. University of Edinburgh (forthcoming).

Singer, M. Thematic structure and the integration of linguistic information. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 549 - 558.

Singer, M. Processes of inference during sentence encoding. Memory and Cognition, 1979, 7, 192 - 200.

Smith, E. E., Chase, W., & Smith, P. Stimulus and response repetition effects in retrieval from short-term memory: Trace decay and memory search. Journal of Experimental Psychology, 1973, 98, 413 - 422.

Springston, F. J. Some cognitive aspects of presupposed coreferential anaphor. Unpublished doctoral dissertation, Stanford University, 1975.

Stenning, K. Anaphora as an approach to pragmatics. In M. Halle, J. Bresnan, & G. A. Miller (Eds.), Linguistic theory and psychological reality. Cambridge, Mass.: MIT Press, 1978.

Turner, E. A., & Rommetveit, R. The effects of focus of attention on storing and retrieving of active and passive voice sentences. Journal of Verbal Learning and Verbal Behavior, 1968, 7, 243 - 248.

Van Dijk, T. A. Text and context: explorations in the semantics and pragmatics of discourse. London: Longman, 1977.

Widdowson, H. G. Teaching language as communication. Oxford: Oxford University Press, 1978.

Wike, E. L., & Church, J. D. Comments on Clark's "The language-as-fixed-effect fallacy". Journal of Verbal Learning and Verbal Behavior, 1976, 15, 249 - 255.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill, 1971.

Yekovich, F. R., & Walker, C. H. Identifying and using referents in sentence comprehension. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 265 - 277.

Yekovich, F., Walker, C., & Blackman, H. Thr role of presupposed and focal information in integrating sentences. Journal of Verbal Learning and Verbal Behavior, 1979, 18, 535 - 548.

Yule, G. New, current and displaced entity reference. University of Edinburgh, 1980. Published in Lingua, 55, 1981.

APPENDIX 1: EXPERIMENT 1

1.1 MATERIALS:

A. Subject sentences:

1. The Queen visited America.

She / The Queen spent four days in New York.

Did the Queen spend three days in New York when she visited America?

2. Simon hit Anne.

He / Simon was drunk.

Was Simon drunk when he hit Anne?

3. Mike lost the match.

He / Mike felt very miserable.

Did Mike feel very miserable after he lost the match?

4. The widow bought the house.

She / The widow had been saving money for ten years.

Had the widow been saving money for ten years?

5. The lion attacked the hunter.

It / The lion had been hungry for two weeks.

Had the lion been hungry for five weeks?

6. Catherine put out the light.

She / Catherine went to bed seven minutes later.

Did Catherine go to bed nine minutes after she put out the light?

7. The girl missed the bus.

She / The girl went to school on foot.

Did the girl go to school by taxi when she missed the bus?

8. The bull chased the farmer.

It / The bull was furious.

Was the bull furious when it chased the farmer?

9. Kate heard the door bell.

She / Kate was preparing the dinner.

Was Kate preparing the dinner when she heard the door bell?

10. The dog saw the thief.

It / The dog barked loudly.

Did the dog bark loudly when it saw the thief?

11. The man caused the accident.

He / The man was driving the car at 95 m.p.h.

Was the man driving the car at 95 m.p.h. when he caused the accident?

12. Tom jumped the fence.

He / Tom fell to the ground.

Did Tom fall to the ground after he jumped the fence?

B. Object sentences:

1. George attended the lecture.

It / The lecture lasted one hour and six minutes.

Did the lecture last one hour and sixteen minutes?

2. Edward kissed Jane.

She / Jane was happy.

Was Jane sad when Edward kissed her?

3. Linda deceived Robert.

He / Robert became very angry.

Did Robert become very angry after Linda deceived him?

4. The mother picked up the baby.

It / The baby had been crying nearly all day.

Had the baby been sleeping nearly all day?

5. The engineer repaired the televison set.

It / The televison set had been out of order for three weeks.

Had the televison set been out of order for three weeks?

6. The snake bit the man.

He / The man died three hours later.

Did the man die three days after the snake bit him?

7. The professor missed the train.

It / The train left the station five minutes ago.

Did the train leave the station three minutes ago?

8. The woman fed the cat.

It / The cat was hungry.

Was the cat hungry when the woman fed it?

9. The car hit the boy.

He / The boy was playing in the street.

Was the boy playing in the street when the car hit him?

10. The man frightened the girl.

She / The girl ran away.

Did the girl stay with the man after he frightened her?

11. The thieves robbed the woman.

She / The woman was walking alone at night.

Was the woman walking alone at night when the thieves robbed her?

12. John kicked the ball.

It / The ball went through the window.

Did the ball go through the window after John kicked it?

* Experimental tapes :

Tape 1 : Practice test.

Tape 2 : Test 1.

Tape 3 : Test 2.

1.2 A mingograph record of a typical trial:

1.3 BASIC OBSERVATIONS:

1.3.1 Native Speakers:

A. Treatments X subjects: number of sentences is 12

Ss	S + P	S + N	O + P	O + N
1	913	911	914	694
2	1079	1086	1044	1058
3	1354	1490	1312	1283
4	1727	1809	1581	1448
5	1282	1237	1382	1224
6	1000	1012	941	838
7	796	926	753	753
8	1785	1840	1770	1721
9	1283	1249	1298	1220
10	1341	1518	1028	943
11	1074	1106	1137	1064
12	683	860	755	910
13	349	353	455	534
Ts	14666	15397	14370	13690
Ms	1128.2	1184.4	1105.4	1053.1

S14	2077	2213	2170	2880

not included in the analysis

Ts	16743	17610	16540	16570
Ms	1195.9	1257.9	1181.4	1183.6

Ss' totals and means with S14

B. Treatment X sentences: number of subjects is 13

Sen	S + P	S + N	O + P	O + N
1	1735	1619	1355	1183
2	1558	1573	1147	1171
3	1215	1347	1314	1446
4	1295	1134	1038	914
5	1328	1579	1106	1208
6	1117	1259	1026	826
7	1173	1151	1021	1307
8	1306	1255	1051	1031
9	1027	1065	1519	1322
10	1011	1127	1270	1054
11	930	1006	1334	1156
12	971	1282	1189	1072
Ts	14666	15397	14370	13690
Ms	1222.2	1283.1	1197.5	1140.8

1.3.2 Non-native speakers:

A. Treatments X subjects: number of sentences is 12

Ss	S + P	S + N	O + P	O + N
1	1030	1013	1126	941
2	1089	988	1133	984
3	1416	1446	1132	1052
4	1202	1120	1146	1240
5	1199	1052	1149	872
6	1441	1353	1328	1278
7	657	616	483	617
8	1172	1193	1467	1167
9	1411	1360	1428	1303
10	1655	1518	1707	1430
11	993	960	899	846
12	275	238	266	265
13	339	379	415	399
Ts	13879	13236	13679	12394
Ms	1067.6	1018.2	1052.2	953.4

S14	3726	3764	3973	3906

not included in the analysis

Ts	17605	17000	17652	16300
Ms	1257.5	1214.3	1260.9	1164.3

Ss' totals and means with S14

B. Treatments X sentences: number of subjects is 13

Sen	S + P	S + N	O + P	O + N
1	1680	1280	1184	1090
2	1454	1440	1155	1121
3	897	1132	1353	1184
4	944	1010	890	944
5	1295	1145	1252	1057
6	1056	1075	886	808
7	1189	1245	1138	1051
8	1342	1231	995	1049
9	955	901	1328	1085
10	1083	1036	1195	1052
11	881	703	1215	940
12	1103	1038	1088	1013
Ts	13879	13236	13679	12394
Ms	1156.6	1103	1139.9	1032.8

1.4 EXPERIMENTAL PLAN: DATA AND ANALYSIS OF VARIANCE:

1.4.1 Data and analysis of variance by subjects:

A. Subjects' type X Antecedent interaction:

A.1. Subjects' totals: number of sentences is 24

A.1.1. + N

Ss	S	O
1	1824	1608
2	2165	2102
3	2844	2595
4	3536	3029
5	2519	2606
6	2012	1779
7	1722	1506
8	3625	3491
9	2532	2518
10	2859	1971
11	2180	2201
12	1543	1665
13	702	989

A.1.2. - N

Ss	S	O
1	2043	2067
2	2077	2117
3	2862	2184
4	2322	2386
5	2251	2021
6	2794	2606
7	1273	1100
8	2365	2634
9	2771	2731
10	3173	3137
11	1953	1745
12	513	531
13	718	814

A.2 Means: number of sentences is 24

	S	O
+ N	2312.5	2158.5
- N	2085.8	2005.6

B. Subjects' type X Anaphoric form interaction

B.1 Subjects' totals: number of sentences is 24

B.1.1 + N

Ss	P	N
1	1827	1605
2	2123	2144
3	2666	2773
4	3308	3257
5	2664	2461
6	1941	1850
7	1549	1679
8	3555	3561
9	2581	2469
10	2369	2461
11	2211	2170
12	1438	1770
13	804	887

B.1.2 - N

Ss	P	N
1	2156	1954
2	2222	1972
3	2548	2498
4	2348	2360
5	2348	1924
6	2769	2631
7	1140	1233
8	2639	2360
9	2839	2663
10	3362	2948
11	1892	1806
12	541	503
13	754	778

B.2 Means: number of sentences is 24

	P	N
+ N	2233.5	2237.5
- N	2119.8	1971.5

C. ANOVA Summary:

Source of variation	Ss	df	MS	F
Between Subjects	14083653.1	25		
Subjects' type	234175.3	1	234175.3	
Error	13849477.8	24	577061.58	
Within Subjects	871446.7	78		
Antecedent	89154.1	1	89154.1	5.03*
Ss' type X Ant.	8880	1	8880	.5
Error	425658.1	24	17735.75	
Anaphoric form	33876.3	1	33876.3	5.54*
Ss' type X Ana.	37658	1	37658	6.16**
Error	146727.9	24	6113.66	
Ant. X Ana.	40527	1	40527	11.68***
Ss' type X Ant. X Ana.	5686.2	1	5686.2	1.64
Error	83279.1	24	3469.96	

* $P < .05$

** $P < .025$

*** $P < .005$

1.4.2 Data and analysis of variance by sentences:

A. Subjects' type X Antecedent interaction:

A. 1 Sentences' totals: to get mean per trial per subject divide by 26

A.1.1 + N

Sen	S	O
1	3354	2538
2	3131	2318
3	2562	2760
4	2429	1952
5	2907	2314
6	2376	1852
7	2324	2328
8	2561	2082
9	2092	2841
10	2138	2324
11	1936	2490
12	2253	2261

A.1.2 - N

Sen	S	O
1	2960	2274
2	2894	2276
3	2029	2537
4	1954	1834
5	2440	2309
6	2131	1694
7	2434	2189
8	2573	2044
9	1856	2413
10	2119	2247
11	1584	2155
12	2141	2101

A. 2 Means: divide by 26

	S	O
+ N	2505.3	2338.3
- N	2259.6	2172.8

B. Subjects' type X Anaphoric form interaction

B.1 Sentences' totals: divide by 26

B.1.1 + N

Sen	P	N
1	3090	2802
2	2705	2744
3	2529	2793
4	2333	2048
5	2434	2787
6	2143	2085
7	2194	2458
8	2357	2286
9	2546	2387
10	2281	2181
11	2264	2162
12	2160	2354

B.1.2 - N

Sen	P	N
1	2864	2370
2	2609	2561
3	2250	2316
4	1834	1954
5	2547	2202
6	1942	1883
7	2327	2296
8	2337	2280
9	2283	1986
10	2278	2088
11	2096	1643
12	2191	2051

B. 2 Means: divide by 26

	P	N
+ N	2419.7	2423.9
- N	2296.5	2135.8

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	1314333.1	11	119484.83	
Subjects' type	253689.9	1	253689.9	
Error	98405.8	11	8945.98	
Antecedent	96583.6	1	96583.6	.85
Error	1247333.1	11	113393.92	
Anaphora	36699.3	1	36699.3	2.83
Error	142692.4	11	12972.01	
Ss' type X Ant.	9620	1	9620	1.6
Error	66231	11	6021	
Ss' type X Ana.	40796.2	1	40796.2	4.7*
Error	95398.8	11	8672.62	
Ant. X Ana..	43904.2	1	43904.2	4.55*
Error	106153.8	11	9650.35	
Ss' type X Ant. X Ana.	6160.1	1	6160.1	.68
Error	99700.7	11	9063.7	

* P < .1 critical value at S percent level = 4.84

1.5. SUB PLAN 1 : DATA AND ANALYSIS OF VARIANCE:

1.5.1. Data and analysis of variance by subjects:

A. Antecedent

A.1 Subjects' totals: Same as A.1.1. + N in 1.4.1. above

A.2 Means: Same as the first row in A.2: 1.4.1. avove

B. Anaphoric form:

B.1. Subjects' totals: Same as B.1.1. + N in 1.4.1. above

B.2. Means: Same as the first row in B.2: 1.4.1. above

C. Antecedent X Anaphoric form:

C.1. Subjects' totals: See 1.3.1: A for the total of each subject on:

1. S + P, S + N
2. O + P, O + N

C.2 Means: See 1.3.1: A for the means of:

1. S + P, S + N
2. O + P, O + N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	6417494.5	12	534791.21	
Antecedent	77154.02	1	77154.02	3.45
Sub X Ant (error)	268490.73	12	22374.23	
Anaphora	50.02	1	50.02	.02
Sub X Ana (error)	67450.73	12	5620.89	
Ant X Ana	38286.94	1	38286.94	16.81*
Sub X Ant X Ana (error)	27324.81	12	2277.07	

* P < .005

1.5.2 Data and Analysis of variance by sentence:

A. Antecedent

A.1 Sentences' totals: Same as A.1.1 + N in 1.4.2. above

A.2 Means: Same as the first row in A.2: 1.4.2 above

B. Anaphoric form:

B.1 Sentences' totals: Same as B.1.1 + N in 1.4.2. above

B.2 Means: Same as the first row in B.2: 1.4.2. above

C. Antecedent X Anaphoric form:

C.1 Sentences' totals: See 1.3.1.B for the total of each sentence on:

1. S + P, S + N

2. O + P, O + N

C.2 Means: See 1.3.1: B for the means of:

1. S + P, S + N

2. O + P, O + N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	735874.73	11	66897.7	
Antecedent	83583.52	1	83583.52	1.22
Sen. X Ant. (error)	754370.73	11	68579.16	
Anaphoric form	54.19	1	54.19	.005
Sen. X Ana (error)	130300.06	11	11845.46	
Ant. X Ana	41477.52	1	41477.52	3.75
Sen. X Ant X Ana (error)	121703.73	11	11063.98	

1.6. SUB PLAN 2: DATA AND ANALYSIS OF VARIANCE:

1.6.1. Data and analysis of variance by subjects:

A. Antecedent:

A.1. Subjects' totals: Same as A.1.2. - N in 1.4.1. above

A.2. Means: Same as the second row in A.2: 1.4.1. above

B. Anaphoric form:

B.1. Subjects' totals: Same as B.1.2. - N in 1.4.1. above

B.2. Means: Same as the second row in B.2: 1.4.1. above

C. Antecedent X Anaphoric form:

C.1. Subjects' totals: See 1.3.2: A for the total of each subject on:

1. S + P, S + N
2. O + P, O + N

C.2. Means: See 1.3.2. for the means of:

1. S + P, S + N
2. O + P, O + N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	7431983.27	12	619331.94	
Antecedent	20880.08	1	20880.08	1.59
Sub X Ant (error)	157167.42	12	13097.29	
Anaphoric form	71484.31	1	71484.31	10.82*
Sub X Ana (error)	79227.19	12	6606.43	
Ant X Ana	7926.23	1	7926.23	1.7
Sub X Ant X Ana (error)	55954.27	12	4662.86	

* P < .01

1.6.2. Data and analysis of variance by sentences:

A. Antecedent:

A.1. Sentences' totals: Same as A.1.2. - N in 1.4.2. above

A.2. Means: Same as the second row in A.2: 1.4.2. above

B. Anaphoric form:

B.1. Sentences' totals: Same as B.1.2. - N in 1.4.2. above

B.2. Means: Same as the second row in B.2: 1.4.2. above

C. Antecedent X Anaphoric form:

C.1. Sentences' totals: See 1.3.2: B for the total of each sentence on:

1. S + P, S + N
2. O + P, O + N

C.2. Means: See 1.3.2: B for the means of:

1. S + P, S + N
2. O + P, O + N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	676864.17	11	61533.11	
Antecedent	22620.09	1	22620.09	.44
Sen X Ant. (error)	559193.41	11	50835.76	
Anaphoric form	77441.34	1	77441.34	7.9*
Sen X Ana (error)	107791.16	11	9799.2	
Ant X Ana	8586.74	1	8586.74	1.12
Sen X Ant X Ana (error)	84150.76	11	7650.07	

* P < .025

1.7 SUB PLAN 3: DATA AND ANALYSIS OF VARIANCE:

1.7.1. Data and analysis of variance by subjects:

A. Subjects' type X Anaphoric form (antecedent subject):

A.1 Subjects' totals: number of sentences is 12

A.1.1. + N

S

Ss	P	N
1	913	911
2	1079	1086
3	1354	1490
4	1727	1809
5	1282	1237
6	1000	1012
7	796	926
8	1785	1840
9	1283	1249
10	1341	1518
11	1074	1106
12	683	860
13	349	353

A.1.2. - N

S

Ss	P	N
1	1030	1013
2	1089	988
3	1416	1446
4	1202	1120
5	1199	1052
6	1441	1353
7	657	616
8	1172	1193
9	1411	1360
10	1655	1518
11	993	960
12	275	238
13	339	379

A.2. Means: number of sentences is 12

S

	P	N
+ N	1128.2	1184.4
- N	1067.6	1018.2

B. Anaphoric Form (antecedent subject):

B.1 Native speakers:

B.1.1.: subjects' totals: Same as A.1.1. above [1.7.1]

B.1.2.: Means: number of sentences is 12

S

	P	N
+ N	1128.2	1184.4

B.2 Non-native speakers:

B.2.1. subjects' totals: Same as A.1.2. above [1.7.1]

B.2.2. Means: number of sentences is 12

S

	P	N
- N	1067.6	1018.2

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between Subjects	8034977.69	25		
Subjects' type	167128.92	1	167128.92	
Error	7867848.77	24	327827.03	
Within Subjects	93619	26		
Anaphora	148.92	1	148.92	.06
Ss' type X Ana.	36305.31	1	36305.31	15.24*
Error	57264.77	24	2381.87	

* $P < .001$

Simple effects:

1. Anaphoric form (antecedent subject): Native Speakers

$F(1,24) = 8.63$, $P < .01$

2. Anaphoric form (antecedent subject): Non-native speakers

$F(1,24) = 6.68$, $P < .025$

1.7.2 Data and analysis of variance by sentences:

A. Subjects' type X Anaphoric form (antecedent subject):

A.1 Sentences' totals: number of subjects is 13

A.1.1. + N

S

Sen	P	N
1	1735	1619
2	1558	1573
3	1215	1347
4	1295	1134
5	1328	1579
6	1117	1259
7	1173	1151
8	1306	1255
9	1027	1065
10	1011	1127
11	930	1006
12	971	1282

A.1.2. - N

S

Sen	P	N
1	1680	1280
2	1454	1440
3	897	1132
4	944	1010
5	1295	1145
6	1056	1075
7	1189	1245
8	1342	1231
9	955	901
10	1083	1036
11	881	703
12	1103	1038

A. 2 Means: number of subjects is 13

S

	P	N
+ N	1222.2	1283.1
- N	1156.6	1103

B. Anaphoric form (Antecedent subject):

B.1 Native speakers:

B.1.1. Sentences' totals: Same as A.1.1. above [1.7.2.]

B.1.2. Means: number of subjects is 13

S

	P	N
+ N	1222.2	1283.1

B.2 Non-native speakers:

B.2.1. Sentences' totals: Same as A.1.2. [1.7.2.]

B.2.2. Means: number of subjects is 13

S

	P	N
- N	1156.6	1103

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	1829479.42	11	166316.31	
Subjects' type	181056.34	1	181056.34	
Error	119939.16	11	10903.56	
Anaphoric form	161.34	1	161.34	.01
Error	137196.16	11	12472.38	
Ss' type X Ana.	39330.74	1	39330.74	4.19*
Error	103212.76	11	9382.98	

* $P < .1$ - critical value at 5 percent = 4.84

Simple effects:

1. Anaphoric form (antecedent subject): Native speakers

$F(1,11) = 2.27$ - not significant

2. Anaphoric form (antecedent subject): Non-native speakers

$F(1,11) = 1.43$ - not significant

1.8. SUB PLAN 4: DATA AND ANALYSIS OF VARIANCE:

1.8.1 Data and analysis of variance by subjects:

A. Subjects' type X Anaphoric form (antecedent object):

A.1 Subjects' totals: number of sentences is 12

A.1.1. + N

0

Ss	P	N
1	914	694
2	1044	1058
3	1312	1283
4	1581	1448
5	1382	1224
6	941	838
7	753	753
8	1770	1721
9	1298	1220
10	1028	943
11	1137	1064
12	755	910
13	455	534

A.1.2. - N

0

Ss	P	N
1	1126	941
2	1133	984
3	1132	1052
4	1146	1240
5	1149	872
6	1328	1278
7	483	617
8	1467	1167
9	1428	1303
10	1707	1430
11	899	846
12	266	265
13	415	399

A.2 Means: number of sentences is 12

O

	P	N
+ N	1105.4	1053.1
- N	1052.2	953.4

B. Anaphoric form (antecedent object):

B.1. Native speakers:

B.1.1. Subjects' totals: Same as A.1.1. [1.8.1]

B.1.2. Means: number of sentences is 12

O

	P	N
+ N	1105.4	1053.1

B.2. Non-native speakers:

B.2.1. Subjects' totals: Same as A.1.2. above [1.8.1.]

B.2.2. Means: number of sentences is 12

O

	P	N
- N	1052.2	953.4

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	6483213.48	25		
Subjects' type	57926.33	1	75926.33	
Error	6407287.15	24	266970.3	
Within subjects	254135.5	26		
Anaphora	74254.33	1	74254.33	10.31*
Ss' type X Ana	7038.94	1	7038.94	.98
Error	172842.23	24	7201.76	

* $P < .005$

Simple effects:

1. Anaphoric form (antecedent object): Native speakers

$F(1,24) = 2.47$ - not significant

2. Anaphoric form (antecedent object): Non native speakers

$F(1,24) = 8.82$, $P < .01$

1.8.2. Data and analysis of variance by sentences:

A. Subjects' type X Anaphoric form (antecedent object):

A.1 Sentences' totals: number of subjects is 13

A.1.1. + N

O

Sen	P	N
1	1355	1183
2	1147	1171
3	1314	1446
4	1038	914
5	1106	1208
6	1026	826
7	1021	1307
8	1051	1031
9	1519	1322
10	1270	1054
11	1334	1156
12	1189	1072

A.1.2. - N

O

Sen	P	N
1	1184	1090
2	1155	1121
3	1353	1184
4	890	944
5	1252	1057
6	886	808
7	1138	1051
8	995	1049
9	1328	1085
10	1195	1052
11	1215	940
12	1088	1013

A.2 Means: number of subjects is 13

0

	P	N
+ N	1197.5	1140.8
- N	1139,9	1032.8

B. Anaphoric form (antecedent object):

B.1 Native speakers:

B.1.1. Sentences' totals: Same as A.1.1. above [1.8.2.]

B.1.2. Means: number of subjects is 13

0

	P	N
+ N	1197.5	1140.8

B.2 Non-native speakers:

B.2.1. Sentences' totals: Same as A.1.2. above [1.8.2.]

B.2.2. Means: number of subjects is 13

0

	P	N
- N	1139.9	1032.8

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	732186.73	11	66562.43	
Subjects' type	82253.52	1	82253.52	
Error	44697.13	11	4063.43	
Anaphoric form	80442.19	1	80442.19	7.93*
Error	111650.06	11	10150.01	
Ss' type X Ana	7625.52	1	7625.52	.91
Error	91886.73	11	8353.34	

* $P < .025$

Simple effects:

1. Anaphoric form (antecedent object): Native speakers:

$F(1,11) = 1.47$ - not significant

2. Anaphoric form (antecedent object): Non native speakers:

$F(1,11) = 12.7$, $P < .005$

1.9. SUB PLAN 5: DATA AND ANALYSIS OF VARIANCE:

1.9.1. Data and analysis of variance by subjects:

A. Subjects' type X Antecedent (anaphoric form: pronoun)

A.1 Subjects' totals: number of sentences is 12

A.1.1. + N

P

Ss	S	O
1	913	914
2	1079	1044
3	1354	1312
4	1727	1581
5	1282	1382
6	1000	941
7	796	753
8	1785	1770
9	1283	1298
10	1341	1028
11	1074	1137
12	683	755
13	349	455

A.1.2. - N

P

Ss	S	O
1	1030	1126
2	1089	1133
3	1416	1132
4	1202	1146
5	1199	1149
6	1441	1328
7	657	483
8	1172	1467
9	1411	1428
10	1655	1707
11	993	899
12	275	266
13	339	415

A.2 Means: number of sentences is 12

P

	S	O
+ N	1128.2	1105.4
- N	1067.6	1052.2

B. Antecedent (anaphoric form: pronoun):

B.1 Native speakers:

B.1.1. Subjects' totals: Same as A.1.1. above [1.9.1.]

B.1.2. Means: number of sentences is 12

P

	S	O
+ N	1128.2	1105.4

B.2. Non native speakers:

B.2.1 Subjects' totals: Same as A.1.2. above [1.9.1.]

B.2.2. Means: number of sentences is 12

P

	S	O
- N	1067.6	1052.2

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	7662649.77	25		
Subjects' type	42009.31	1	42009.31	
Error	7620640.46	24	317526.69	
Within subjects	201291	26		
Antecedent	4731.08	1	4731.08	.58
Ss' type X Ant.	177.23	1	177.23	.02
Error	196382.69	24	8182.61	

Simple effects:

1. Antecedent (anaphoric form: pronoun): Native speakers:

$F(1, 24) < 1$

2. Antecedent (anaphoric form: Pronoun): Non native speakers:

$F(1, 24) < 1$

1.9.2. Data and analysis of variance by sentences:

A. Subjects' type X Antecedent (anaphoric form: pronoun):

A.1 Sentences' totals: number of subjects is 13

A.1.1. + N

P

Sen	S	O
1	1735	1355
2	1558	1147
3	1215	1314
4	1295	1038
5	1328	1106
6	1117	1026
7	1173	1021
8	1306	1051
9	1027	1519
10	1011	1270
11	930	1334
12	971	1189

A.1.2. - N

P

Sen	S	O
1	1680	1184
2	1454	1155
3	897	1353
4	944	890
5	1295	1252
6	1056	886
7	1189	1138
8	1342	995
9	955	1328
10	1083	1195
11	881	1215
12	1103	1088

A.2 Means: number of subjects is 13

P

	S	O
+ N	1222.2	1197.5
- N	1156.6	1139.9

B. Antecedent [anaphoric form: pronoun]:

B.1. Native speakers:

B.1.1. Sentences' totals: Same as A.1.1. above [1.9.2.]

B.1.2. Means: number of subjects is 13

P

	S	O
+ N	1222.2	1197.5

B.2 Non-native speakers:

B.2.1. Sentences' totals: Same as A.1.2. above [1.9.2.]

B.2.2. Means: number of subjects is 13

P

	S	O
- N	1156.6	1139.9

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	749972.92	11	68279.36	
Subjects' type	45510.09	1	45510.09	
Error	93678.91	11	8516.26	
Antecedent	5125.34	1	5125.34	.06
Error	917349.66	11	83395.42	
Ss' type X Ant.	191.99	1	191.99	.02
Error	86449.01	11	7859	

Simple effects:

1. Antecedent (anaphoric form: pronoun): Native speakers

$F(1,11) = < 1$

2. Antecedent (anaphoric form: pronoun): Non-native speakers

$F(1,11) = < 1$

1. 10 SUB PLAN 6: DATA AND ANALYSIS OF VARIANCE

1.10.1 Data and analysis of variance by subjects

A. Subjects' type X Antecedent (anaphoric form: Noun)

A.1 Subjects' totals: number of sentences is 12

A.1.1. + N

N

Ss	S	O
1	911	694
2	1086	1058
3	1490	1283
4	1809	1448
5	1237	1224
6	1012	838
7	926	753
8	1840	1721
9	1249	1220
10	1518	943
11	1106	1064
12	860	910
13	353	534

A.1.2. - N

N

Ss	S	O
1	1013	941
2	988	984
3	1446	1052
4	1120	1240
5	1052	872
6	1353	1278
7	616	617
8	1193	1167
9	1360	1303
10	1518	1430
11	960	846
12	238	265
13	379	399

A.2 Means: number of sentences is 12

N

	S	O
+ N	1184.4	1053.1
- N	1018.2	953.4

B. Antecedent (anaphoric form: Noun):

B.1. Native speakers:

B.1.1. Subjects' totals: Same as A.1.1. above [1.10.1]

B.1.2. Means: number of sentences is 12

N

	S	O
+ N	1184.4	1053.1

B.2 Non- native speakers:

B.2.1. Subjects' totals: Same as A.1.2. above [1.10.1]

B.2.2. Means: number of sentences is 12

N

	S	O
- N	1018.2	953.4

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	6605389.25	25		
Subjects' type	229824.02	1	229824.02	
Error	6375565.23	24	265648.55	
Within subjects	451362.5	26		
Antecedent	124950.02	1	124950.02	9.61*
Ss' type X Ant.	14388.94	1	14388.94	1.11
Error	312023.54	24	13000.98	

* $P < .005$

Simple effects:

1. Antecedent (anaphoric form: Noun): Native speakers

$F(1,24) = 8.62$, $P < .01$

2. Antecedent (anaphoric form: Noun): Non-native speakers

$F(1,24) = 2.1$ not significant

1.10.2. Data and analysis of variance by sentences:

A. Subjects' type X Antecedent (anaphoric form: Noun):

A.1. Sentences' totals: number of subjects is 13

A.1.1. + N

N

Sen	S	O
1	1619	1183
2	1573	1171
3	1347	1446
4	1134	914
5	1579	1208
6	1259	825
7	1151	1307
8	1255	1031
9	1065	1322
10	1127	1054
11	1006	1156
12	1282	1072

A.1.2. - N

N

Sen	S	O
1	1280	1090
2	1440	1121
3	1132	1184
4	1010	944
5	1145	1057
6	1075	808
7	1245	1051
8	1231	1049
9	901	1085
10	1036	1052
11	703	940
12	1038	1013

A.2. Means: number of subjects is 13

N

	S	O
+ N	1283.1	1140.8
- N	1103	1032.8

B. Antecedent [anaphoric form: Noun]:

B.1. Native speakers:

B.1.1. Sentences' totals: Same as A.1.1. above [1.10.2]

B.1.2. Means: number of subjects is 13

N

	S	O
+ N	1283.1	1140.8

B.2 Non- native speakers:

B.2.1. Sentences' totals: Same as A.1.2. above [1.10.2]

B.2.2. Means: number of subjects is 13

N

	S	O
- N	1103	1032.8

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	707052.56	11	64277.51	
Subjects' type	248976.02	1	248976.02	
Error	100125.73	11	9102.34	
Antecedent	135362.52	1	135362.52	3.41*
Error	436137.23	11	39648.84	
Ss' type X Ant.	15588.02	1	15588.02	2.16
Error	79482.73	11	7225.7	

* $P < .1$

Simple effects:

1. Antecedent (anaphoric form: noun): Native speakers:

$F(1,11) = 3.79$, $P < .1$

2. Antecedent (anaphoric form: Noun): Non-native speakers:

$F(1,11) = 1.99$ - not significant

1.11 CORRELATION BETWEEN LENGTH OF SENTENCES (IN WORDS AND TIME) AND REACTION TIME: DATA AND RESULTS.

A: DATA: number of subjects is 13

Sen.	LW	LT	RT
1	4	152	2104
2	3	131	2226
3	3	116	1858
4	4	109	2109
5	5	129	1770
6	5	134	1487
7	5	174	1433
8	4	130	1415
9	5	160	1535
10	5	163	1540
11	5	146	1424
12	5	132	1722
13	3	141	1319
14	5	124	2161
15	5	158	1569
16	6	154	1100
17	5	127	1565
18	5	140	1121
19	4	146	1325
20	5	110	1443
21	5	162	1375
22	6	232	1278
23	5	132	1132
24	4	118	1273

297

B. Results:

B.1 Length in words and reaction time:

r = - . 5, with 22 df, significance level = .02

B.2 Length in time and reaction time:

r = - . 33, with 22 df, not reliable

APPENDIX 2: EXPERIMENT 2

2.1. MATERIALS:

1. Shakespeare died in 1616.

He/Shakespeare left £10 for the poor of Stratford.

Dis Shakespeare leave £20 for the poor of Stratford?

2. The Queen Mother celebrated her 80th birthday in August.

She/The Queen Mother received hundreds of cards from well-wishers.

Did the Queen Mother receive hundreds of cards from well-wishers?

3. Hitler rose to power in 1933.

He/Hitler committed suicide in 1945.

Did Hitler commit suicide in 1947?

4. Prince Charles visited America.

He/Prince Charles spent 3 days in California.

Did Prince Charles spend 4 days in California?

5. President Brezhnev made a speech on foreigh policy.

He/President Brezhnev described China as the most serious threat to peace in the world.

Did President Brezhnev describe China as the most serious threat to peace in the world?

6. Mr. Callaghan attacked the government's policies.

He/Mr. Callaghan said that unemployment figures are the highest since the thirties.

Did Mr. Callaghan say that unemployment figures are the highest since the thirties?

7. The Shah left Iran in January last year.

He/The Shah died in Eygpt 20 months later.

Did the Shah die 10 months after he left Iran?

8. Amin fled from Uganda 18 months ago.

He/Amin had been in power for 8 years.

Had Amin been in power for 8 years?

9. President Sadat signed a peace treaty with Israel.

He/President Sadat angered most of the Arab leaders.

Did President Sadat anger most of the Arab leaders?

10. Khomeini returned to Iran in February 1979.

He/Khomeini had been living in exile for 15 years.

Had Khomeini been living in exile for 18 years?

11. Lord Carrington went to Saudi Arabia in August.

He/Lord Carrington succeeded in persuading the Saudis to restore good relations with Britain.

Did Lord Carrington succeed in persuading the Saudis to restore good relations with Britain?

12. Sebastian Coe won the 1500 metres in the Moscow Olympics.

He/Sebastian Coe was extremely delighted.

Was Sebastian Coe extremely delighted when he won the 1500 metres in Moscow?

13. Princess Anne lives in Gloucestershire.

She/Princess Anne is fourth in line to the throne.

Is Princess Anne sixth in line to the throne?

14. President Carter sent a message to the Russian leaders.

He/President Carter demanded the immediate withdrawal of the Soviet troops from Afghanistan.

Did President Carter demand the immediate withdrawal of the Soviet troops from Afghanistan?

15. Mrs. Thatcher became Prime Minister in May last year.

She/Mrs. Thatcher won the general election with an overall majority of 43 seats.

Dis Mrs. Thatcher win the general election with an overall majority of 34 seats?

16. Churchill led Britain to victory in the second war.

He/Churchill died in 1965.

Did Churchill die in 1962?

* Experimental tapes:

Tape 1 : Test 1

Tape 2 : Test 2

2.2. DATA AND ANALYSIS OF VARIANCE:

2.2.1. By Subjects:

A: Treatments X Subjects: number of sentences is 8

Ss	[CSu] + P	[CSu] + N
1	586	514
2	495	640
3	823	571
4	655	817
5	1500	1670
6	1164	489
7	381	1110
8	822	1202
9	536	546
10	1477	1603
11	1411	1522
12	689	600
13	776	709
14	1800	1926

Ss	[CSu] + P	[CSu] + N
15	786	879
16	502	677
17	742	811
18	526	511
19	790	862
20	716	687

B. Totals and Means: number of sentences is 8

	[CSu] + P	[CSu] + N
Ts	17207	18346
Ms	860.4	917.3

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Anaphoric form	32433.02	1	32433.02	4.45*
Subjects	6538553.27	19	344134.38	
Ana X Ss (error)	138575.48	19	7293.45	
Total	6709561.77	39		

* $P < .05$

2.2.2. By Sentences: number of subjects is 10

A. Treatments X Sentences:

Sen	[CSu] + P	[CSu] + N
1	1353	1227
2	1225	1336
3	1019	1046
4	959	792
5	898	914
6	876	935
7	1196	1215
8	1284	1296
9	1334	973
10	923	1847
11	1102	1245
12	1317	1241
13	610	1037
14	784	668
15	1280	1386
16	1047	1188

B. Totals and Means: number of subjects is 10

	[Csu] + P	[CSu] + N
Ts	17207	18346
Ms	1075.4	1146.6

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Anaphoric form	40541.28	1	40541.28	1
Sentences	1273680.47	15	84912.03	
Ana X Sen (error)	608599.22	15	40573.28	
Total	1922820.97	31		

2.3 LENGTH OF CONTEXT SENTENCES (IN WORDS AND TIME) AND REACTION TIME:

number of subjects is 20

Sen	LW	LT	RT
1	5	229	2633
2	9	325	2386
3	8	266	2312
4	4	187	2556
5	8	325	1839
6	6	276	2270
7	8	296	2326
8	7	305	1891
9	8	329	2320
10	9	381	2381
11	8	269	2727
12	11	395	2382
13	5	198	2193
14	9	310	2428
15	9	340	2063
16	9	298	2307

APPENDIX 3: EXPERIMENT 3

3.1. Materials:

A. Subject passages:

1. The woman sold the house.

It was very big.

* It contained 18 bedrooms.

* It had a swimming pool.

She/The woman was desperately in need of money.

Was it a very big house that the woman sold?

2. The policeman admired the nurse.

She was unmarried.

* She was 20 years old.

* She lived near the city centre.

He/The policeman had been divorced 5 years ago.

Had the policeman been divorced for 8 years?

3. Susan phoned Simon.

He wasn't in his office.

* He had gone to France on a business trip.

* He would not be back for 2 weeks.

She/Susan wanted to invite him to a coffee party.

Did Susan want to invite Simon to a dinner party?

4. The fisherman shot the whale.

It died 2 hours later.

* It was huge.

* It weighed hundreds of pounds.

He/The fisherman got very excited.

Did the whale die 2 hours after the fisherman shot it?

5. The dog attacked the postman.

He complained to the owner.

* He would not deliver the letters.

* He decided to come back later.

It/The dog was standing in the garden.

Did the postman complain to the owner after the dog attacked him?

6. John scored the goal.

It came 10 minutes before the end of the match.

* It was a header.

* It was a fine goal.

He/John was absolutely delighted.

Did the goal come 10 minutes before the end of the match?

7. Joe beat Cathy.

She very angry.

* She wouldn't stay in the house any longer.

* She went to live with her parents.

He/Joe had been drinking in the pub for 6 hours.

Had Joe been drinking in the pub for 8 hours?

8. The engineer repaired the refrigerator.

It had been out of order for 2 weeks.

* It was secondhand.

* It was six years old.

He/The engineer took 3 hours to repair it.

Did the engineer take 2 hours to repair the refrigerator?

9. The Rolls Royce struck the woman.

She fell down unconscious.

* She could hardly breathe.

* She died shortly afterwards.

It/The Rolls Royce was travelling at a very high speed.

Was the Rolls Royce travelling slowly when it struck the woman?

10. Bill bought the car.

It cost a lot of money.

* It was brand new.

* It was the latest model.

He/Bill had been thinking of buying it for 3 weeks.

Had Bill been thinking of buying the car for 5 weeks?

11. Mike found the girl.

She had been missing for 3 days.

* She had run away from home.

* She was only 10 years old.

He/Mike phoned the nearest police station.

Had the girl been missing for 3 days?

12. Nancy comforted Tom.

He had been ill for 5 months.

* He was living alone.

* He owned a small flat in town.

She/Nancy spent 3 hours with him.

Had Tom been ill for 5 months?

B. Object passages:

1. The mother picked up the baby.

She had been washing nearly all afternoon.

* She would not be finished for some time.

* She was very tired.

It/The baby was greatly in need of comfort.

Had the mother been ironing nearly all afternoon)

2. The midwife fancied the milkman.

She was a widow.

* She was in her late forties.

* She had two grown up children.

He/The milkman had been married for 3 years.

Had the milkman been married for 5 years?

3. Robert assaulted Mary.

He didn't show any sign of regret.

* He was some sort of a sadist.

* He couldn't resist being violent.

She/Mary vowed to report him to the police.

Did Mary vow to report Robert to the police?

4. The elephant surprised the hunter.

It came from behind the hill.

* It was excited.

* It was making a loud noise.

He/The hunter became very frightened.

Did the hunter become very frightened?

5. The fireman rescued the girl.

He showed a great deal of courage.

* He didn't mind risking his own life.

* He had been a fireman for only 2 months.

She/The girl was screaming in the burning room.

Did the fireman show a great deal of courage?

6. The ball hit Tony.

It came from the direction of the playground.

* It was very heavy.

* It was covered in mud.

He/Tony was extremely angry.

Did the ball come from the direction of the playground?

7. Sally missed Jim.

She felt very lonely.

* She wasn't very keen on getting out of the house.

* She spent most of her time reading.

He/Jim had been doing some work abroad for 2 weeks.

Had Jim been doing some work abroad for 5 weeks?

8. The building fascinated the photographer.

It was exceptionally beautiful.

* It was very high.

* It was 2 years old.

He/The photographer spent 20 minutes photographing it.

Did the photographer spend 30 minutes photographing the building?

9. The boy scratched the Mercedes.

He ran away.

* He didn't dare look back.

* He was afraid of being caught.

It/The Mercedes was standing by the kerb.

Did the boy run away after he scratched the Mercedes?

10. The doorman stopped Linda.

He was a bore.

* He was very talkative.

* He had no sense of humour.

She/Linda had been trying to avoid him for 2 months.

Had Linda been trying to avoid the doorman for 5 months?

11. The snake bit George.

It was hiding under the rocks.

* It was 2 feet long.

* It was poisonous.

He/George went to the nearest hospital.

Was the snake hiding under the rocks when it bit George?

12. Edward visited Jane.

He had been out of work for 8 months.

* He was running short of money.

* He had many bills to pay.

She/Jane lent him 200 pounds.

Had Edward been out of work for 10 months?

* Experimental tapes accompany the tiesis:

Tape 1 : Block 1

Tape 2 : Block 2

Tape 3 : Block 3

Tape 4 : Block 4

3.2. BASIC OBSERVATIONS:

3.2.1. Treatments X Subjects: number of sentences is 3

Ss	S+1/P	S+3/P	S+1/N	S+3/N	O+1/P	O+3/P	O+1/N	O+3/N
1	188	190	170	224	182	299	206	190
2	444	382	342	384	406	388	368	438
3	166	163	162	200	134	203	196	146
4	211	162	124	216	244	176	154	193
5	210	185	110	284	221	180	225	156
6	176	160	101	227	236	183	185	175
7	240	210	165	195	252	170	234	193
8	185	306	204	196	242	223	174	212
9	175	171	137	166	180	271	194	231
10	174	190	126	159	152	233	123	205
11	458	474	501	425	452	523	475	451
12	535	483	626	460	648	556	505	463
13	390	316	313	351	366	342	338	329
14	435	451	488	428	490	542	415	495
15	226	207	189	218	259	222	204	110
16	142	203	236	112	210	213	217	139
17	177	184	188	180	257	149	222	135
18	314	398	431	360	410	378	456	311
19	76	166	131	117	128	166	146	86
20	139	179	171	221	159	267	193	213
21	389	419	362	298	445	443	367	281
22	146	144	121	196	199	201	227	158
23	132	168	132	200	186	130	119	122
24	127	139	190	179	176	210	97	169
25	166	160	173	75	171	282	213	186
26	212	130	186	109	179	185	83	158
27	173	219	289	175	284	299	274	165
28	197	78	243	174	165	168	230	173
Ts	6603	6637	6611	6529	7433	7603	6840	6283
Ms	235.8	237	236.1	233.2	265.5	271.5	244.3	224.4

3.2.2. Treatments X Sentences: number of subjects is 7

Sen	S+1/P	S+3/P	S+1/N	S+3/N	O+1/P	O+3/P	O+1/N	O+3/N
1	797	516	489	586	984	601	450	473
2	551	441	450	832	695	600	574	855
3	546	826	567	424	642	953	584	388
4	332	611	800	589	482	521	590	441
5	520	309	283	655	487	427	422	699
6	784	478	464	539	798	521	385	500
7	399	606	785	571	482	746	829	693
8	422	539	810	570	396	571	805	357
9	463	748	490	354	472	826	515	360
10	626	817	651	330	561	912	706	383
11	392	288	441	697	686	448	572	832
12	771	458	381	381	748	477	408	302
Ts	6603	6637	6611	6529	7433	7603	6840	6283
Ms	550.3	553.1	550.9	544.1	619.4	633.6	570	523.6

3.3. EXPERIMENTAL PLAN: DATA AND ANALYSIS OF VARIANCE:

3.1.1. By Subjects:

A. Antecedent:

A.1. Subjects' totals: number of sentences is 12

Ss	S	O
1	772	877
2	1552	1600
3	691	679
4	713	767
5	789	782
6	664	779
7	810	849
8	891	851
9	649	876
10	649	713
11	1858	1901
12	2104	2172
13	1370	1375
14	1802	1943

Ss	S	O
15	840	795
16	693	779
17	729	763
18	1503	1555
19	490	526
20	710	832
21	1468	1536
22	607	785
23	632	557
24	635	652
25	574	852
26	637	605
27	856	1022
28	692	736

A.2 Means: number of sentences is 12

S	O
942.1	1005.7

B. Anaphoric form:

B.1. Subjects' totals: number of sentences is 12

Ss	P	N
1	859	790
2	1620	1532
3	666	704
4	793	687
5	796	775
6	755	688
7	872	787
8	956	786
9	797	728
10	749	613
11	1907	1852
12	2222	2054
13	1414	1331
14	1919	1826

Ss	P	N
15	914	721
16	768	704
17	767	725
18	1500	1558
19	536	480
20	744	798
21	1696	1308
22	690	702
23	616	573
24	652	635
25	779	647
26	706	536
27	975	903
28	608	820

B.2 Means: number of sentences is 12

P	N
1009.9	938

C. Distance:

C.1. Subjects' totals: number of sentences is 12

Ss	+1	+3
1	746	903
2	1560	1592
3	658	712
4	733	747
5	766	805
6	698	745
7	891	768
8	805	937
9	686	839
10	575	787
11	1886	1873
12	2314	1962
13	1407	1338
14	1828	1917

Ss	+1	+3
15	878	757
16	805	667
17	844	648
18	1611	1447
19	481	535
20	662	880
21	1563	1441
22	693	699
23	569	620
24	590	697
25	723	703
26	660	582
27	1020	858
28	835	593

C.2 Means: number of sentences is 12

+1	+3
981.7	966.1

D. Antecedent X Anaphoric form:

D.1. Subjects' totals: number of sentences is 6

S1

	P	N
S	378	394
O	481	396

S2

	P	N
S	826	726
O	794	806

S3

	P	N
S	329	362
O	337	342

S4

	P	N
S	373	340
O	420	347

S5

	P	N
S	395	394
O	401	381

S6

	P	N
S	336	328
O	419	360

S7

	P	N
S	450	360
O	422	427

S8

	P	N
S	491	400
O	465	386

S9

	P	N
S	346	303
O	451	425

S10

S	364	285
O	385	328

S11

S	932	926
O	975	926

S12

S	1018	1086
O	1204	968

S13

	P	N
S	706	664
O	708	667

S14

	P	N
S	886	916
O	1033	910

S15

	P	N
S	433	407
O	481	314

S16

	P	N
S	345	348
O	423	356

S17

	P	N
S	361	368
O	406	357

S18

	P	N
S	712	791
O	788	767

S19

	P	N
S	242	248
O	294	232

S20

	P	N
S	318	392
O	426	406

S21

	P	N
S	808	660
O	888	648

S22

	P	N
S	290	317
O	400	385

S23

	P	N
S	300	332
O	316	241

S24

	P	N
S	266	369
O	386	266

S25

	P	N
S	326	248
O	453	399

S26

	P	N
S	342	295
O	364	241

S27

	P	N
S	392	464
O	583	439

S28

	P	N
S	275	417
O	333	403

D.2 Means: number of sentences is 6

	P	N
S	472.9	469.3
O	537	468.7

E. Distance X Antecednet:

E.1 Subjects' totals: number of sentences is 6

S1

	S	O
+1	358	388
+3	414	489

S2

	S	O
+1	786	774
+3	766	826

S3

	S	O
+1	328	330
+3	363	349

S4

	S	O
+1	335	398
+3	378	369

S5

	S	O
+1	320	446
+3	469	336

S6

	S	O
+1	277	421
+3	387	358

S7

	S	O
+1	405	486
+3	405	363

S8

	S	O
+1	389	416
+3	502	435

S9

	S	O
+1	312	374
+3	337	502

S10

	S	O
+1	300	275
+3	349	438

S11

	S	O
+1	959	927
+3	899	974

S12

	S	O
+1	1161	1153
+3	943	1019

S13

	S	O
+1	703	704
+3	667	671

S14

	S	O
+1	923	905
+3	879	1038

S15

	S	O
+1	415	463
+3	425	332

S16

	S	O
+1	378	427
+3	315	352

S17

	S	O
+1	365	479
+3	364	284

S18

	S	O
+1	745	866
+3	758	689

S19

	S	O
+1	207	274
+3	283	252

S20

	S	O
+1	310	352
+3	400	480

S21

	S	O
+1	751	812
+3	717	724

S22

	S	O
+1	267	426
+3	340	359

S23

	S	O
+1	264	305
+3	368	252

S24

	S	O
+1	317	273
+3	318	379

S25

	S	O
+1	339	384
+3	235	468

S26

	S	O
+1	398	262
+3	239	343

S27

	S	O
+1	462	558
+3	394	464

S28

	S	O
+1	440	395
+3	252	341

E.2 Means: number of sentences is 6

	S	O
+1	471.9	509.8
+3	470.2	495.9

F. Distance X Anaphoric form:

F.1. Subjects' totals: number of sentences is 6

S1

	P	N
+1	370	376
+3	489	414

S2

	P	N
+1	850	710
+3	770	822

S3

	P	N
+1	300	358
+3	366	246

S4

	P	N
+1	455	278
+3	338	409

S5

	P	N
+1	431	335
+3	365	440

S6

	P	N
+1	412	286
+3	343	402

S7

	P	N
+1	492	399
+3	380	388

S8

	P	N
+1	427	378
+3	529	408

S9

	P	N
+1	355	331
+3	442	397

S10

	P	N
+1	326	249
+3	423	364

S11

	P	N
+1	910	976
+3	997	876

S12

	P	N
+1	1183	1131
+3	1039	923

S13

	P	N
+1	756	651
+3	658	680

S14

	P	N
+1	925	903
+3	994	923

S15

	P	N
+1	485	393
+3	429	328

S16

	P	N
+1	352	453
+3	416	251

S17

	P	N
+1	434	410
+3	333	315

S18

	P	N
+1	724	887
+3	776	671

S19

	P	N
+1	204	277
+3	332	203

S20

	P	N
+1	298	364
+3	446	434

S21

	P	N
+1	834	729
+3	862	579

S22

	P	N
+1	345	348
+3	345	354

S23

	P	N
+1	318	251
+3	298	322

S24

	P	N
+1	303	287
+3	349	348

S25

	P	N
+1	337	386
+3	442	261

S26

	P	N
+1	391	269
+3	315	267

S27

	P	N
+1	457	563
+3	518	340

S28

	P	N
+1	362	473
+3	246	347

F.2 Means: number of sentences is 6

	P	N
+1	501.3	480.4
+3	508.6	457.6

G. Distance X Antecedent X Anaphoric form:

Subjects' totals and means: Same as 3.2.1. above

H. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	2747852.26	27	101772.31	
Antecedent	14128.75	1	14128.75	16.84***
Error (S X Ant.)	22655,12	27	839.08	
Anaphoric form	18090.04	1	18090.04	13.32*
Error (S X Ana)	36670.83	27	1358.18	
Distance	844.75	1	844.75	.34
Error (S X Dis.)	66639.62	27	2468.13	
Ant. X Ana.	14673.97	1	14673.97	14.45**
Error (S X Ant. X Ana.)	27411.41	27	1015.24	
Dis X Ant.	513.04	1	513.04	.23
Error (S X Dis X Ant.)	59692.83	27	2210.85	
Dis X Ana.	3172.54	1	3172.54	1.16
Error (S X Dis X Ana.)	73973.33	27	2739.75	
Dis X Ant. X Ana.	1666.61	1	1666.61	1.29
Error (S X Dis X Ant. X Ana)	34942.76	27	1294.18	

* $P < .0011$

** $P < .0007$

*** $P < .0003$

3.3.2. By Sentences:

A. Antecedent:

A.1. Sentences' totals: number of subjects is 28

Sen	S	O
1	2388	2508
2	2274	2724
3	2363	2567
4	2332	2034
5	1768	2035
6	2265	2204
7	2361	2750
8	2341	2129
9	2055	2173
10	2424	2562
11	1818	2538
12	1991	1935

A.2 Means: number of subjects is 28

S	O
2198.3	2346.6

B. Anaphoric form:

B.1. Sentences' totals: number of subjects is 28

Sen	P	N
1	2898	1998
2	2287	2711
3	2967	1963
4	1946	2420
5	1743	2060
6	2581	1888
7	2233	2878
8	1928	2542
9	2509	1719
10	2916	2070
11	1814	2542
12	2454	1472

B.2. Means: number of subjects is 28

P	N
2356.3	2188.6

C. Distance:

C.1. Sentences' totals: number of subjects is 28

Sen	+1	+3
1	2720	2176
2	2270	2728
3	2339	2591
4	2204	2162
5	1712	2091
6	2431	2038
7	2495	2616
8	2433	2037
9	1940	2288
10	2544	2442
11	2091	2265
12	2308	1618

C.2. Means: number of subjects is 28

+1	+3
2290.6	2254.3

D. Antecedent X Anaphoric form:

D.1 Sentences' totals: number of subjects is 14

Sen1

	P	N
S	1313	1075
O	1585	923

Sen2

	P	N
S	992	1282
O	1295	1429

Sen3

	P	N
S	1372	991
O	1595	972

Sen4

	P	N
S	943	1389
O	1003	1031

Sen5

	P	N
S	829	939
O	914	1121

Sen6

	P	N
S	1262	1003
O	1319	885

Sen 7

	P	N
S	1005	1356
O	1228	1522

Sen 8

	P	N
S	961	1380
O	967	1162

Sen 9

	P	N
S	1211	844
O	1298	875

Sen 10

	P	N
S	1443	981
O	1473	1089

Sen 11

	P	N
S	680	1138
O	1134	1404

Sen 12

	P	N
S	1229	762
O	1225	710

D.2 Means: number of subjects is 14

	P	N
S	1103.3	1095
O	1253	1093.6

E. Distance X Antecedent:

E.1 Sentences' totals: number of subjects is 14

Sen 1

	S	O
+1	1286	1434
+3	1102	1074

Sen 2

	S	O
+1	1001	1269
+3	1273	1455

Sen 3

	S	O
+1	1113	1226
+3	1250	1341

Sen 4

	S	O
+1	1132	1072
+3	1200	962

Sen 5

	S	O
+1	803	909
+3	965	1126

Sen 6

	S	O
+1	1248	1183
+3	1017	1021

Sen 7

	S	O
+1	1184	1311
+3	1177	1439

Sen 8

	S	O
+1	1232	1201
+3	1109	928

Sen 9

	S	O
+1	953	987
+3	1102	1186

Sen 10

	S	O
+1	1277	1267
+3	1147	1295

Sen 11

	S	O
+1	833	1258
+3	985	1280

Sen 12

	S	O
+1	1152	1156
+3	839	779

E. 2 Means: number of subjects is 14

	S	O
+1	1101.2	1189.4
+3	1097.2	1157.2

F. Distance and Anaphoric form:

F.1 Sentences' totals: number of subjects is 14

Sen 1

	P	N
+1	1781	939
+3	1117	1059

Sen 2

	P	N
+1	1246	1024
+3	1041	1687

Sen 3

	P	N
+1	1188	1151
+3	1779	812

Sen 4

	P	N
+1	814	1390
+3	1132	1030

Sen 5

	P	N
+1	1007	705
+3	736	1355

Sen 6

	P	N
+1	1582	849
+3	999	1039

Sen 7

	P	N
+1	881	1614
+3	1352	1264

Sen 8

	P	N
+1	818	1615
+3	1110	927

Sen 9

	P	N
+1	935	1005
+3	1574	714

Sen 10

	P	N
+1	1187	1357
+3	1729	713

Sen 11

	P	N
+1	1078	1013
+3	736	1529

Sen 12

	P	N
+1	1519	789
+3	935	683

F.2 Means: number of subjects is 14

	P	N
+1	1169.7	1120.9
+3	1186.7	1067.7

G. Distance X Antecedent X Anaphoric form:

Sentences' totals and means: Same as 3.2.2. above.

H. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	263106.12	11	23918.74	
Antecedent	32967.09	1	32967.09	3.19
Error (Sen. X Ant.)	113670.28	11	10333.66	
Anaphoric form	42210.09	1	42210.09	.61
Error (Sen. X Ana.)	761583.78	11	69234.89	
Distance	1971.09	1	1971.09	.1
Error (Sen. X Dis.)	207828.78	11	18893.53	
Ant. X Ana.	34239.27	1	34239.27	9.92*
Error (Sen. X Ant. X Ana.)	37976.61	11	3452.42	
Dis. X Ant.	1197.1	1	1197.1	.67
Error (Sen. X Dis. X Ant.)	19741.78	11	1794.71	
Dis X Ana.	7402.6	1	7402.6	.07
Error (Sen. X Dis. X Ana.)	1118724.78	11	101702.25	
Dis. X Ant. X Ana.	3888.75	1	3888.75	1.19
Error (Sen. X Dis. X Ant. X Ana.)	36081.62	11	3280.15	

* $P < .01$

3.4. SUB PLAN 1: DATA AND ANALYSIS OF VARIANCE:

3.4.1. By Subjects:

A. Anaphoric form (at S):

Subjects' totals: Same as the first row for each of the subjects in 3.3.1: D.1.

Means: Same as the first row in 3.3.1: D.2.

B. Distance (at S):

Subjects' totals: Same as the first column for each of the subjects in 3.3.1: E.1.

Means: Same as the first column in 3.3.1: E.2.

C. Distance X Anaphoric form (at S):

C.1. Subjects' totals:

See Table 3.2.1 for the totals of each subject on:

1. S + 1/P, S + 1/N
2. S + 3/P, S + 3/N

C. Means:

See Table 3.2.1 for the means of:

1. S + 1/P, S + 1/N
2. S + 3/P, S + 3/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	1372289.857	27	50825.55	
Anaphoric form	89.286	1	89.286	.08
Error (S X Ana)	31082.714	27	1151.21	
Distance	20.571	1	20.571	.01
Error (S X Dis)	55615.429	27	2059.83	
Dis X Ana	120.143	1	102.143	.05
Error (S X Dis X Ana)	70091.857	27	2595.99	

1. Simple effects of Anaphoric form:

1.1 At S +1:

$F < 1$

1.2 At S +3:

$F < 1$

2. Simple effects of distance:

2.1 At S/P

$F < 1$

2.2 At S/N

$F < 1$

3.4.2. By sentences:

A. Anaphoric form (at S):

Sentences' totals: Same at the first row for each of the sentences in 3.2.2.: D.1

Means: Same as the first row in 3.3.2: D.2

B. Distance (at S):

Sentences' totals: Same as the first column for each of the sentences in 3.3.2: E.1.

Means: Same as the first column in 3.3.2: E.2.

C. Distance X Anaphoric form (at S):

C.1. Sentences' totals:

See Table 3.2.2. for the totals of each sentence on:

1. S + 1/P, S + 1/N

2. S + 3/P, S + 3/N

C.2. Means:

See Table 3.2.2. for the means of:

1. S + 1/P, S + 1/N

2. S + 3/P, S + 3/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	145559.17	11	13232.65	
Anaphoric form	208.34	1	208.34	.01
Error (Sen X Ana)	409479.16	11	37225.38	
Distance	48	1	48	.01
Error (Sen X Dis)	96499.5	11	8772.68	
Dis X Ana	280.33	1	280.33	.01
Error (Sen X Dis X Ana)	565179.17	11	51379.92	

1. Simple effects of Anaphoric form:

1.1. At S + 1: $F < 1$

1.2. At S + 3: $F < 1$

2. Simple effects of distance:

2.1. At S/P: $F < 1$

2.2. At S/N: $F < 1$

3.5 SUB PLAN 2: DATA AND ANALYSIS OF VARIANCE:

3.5.1. By Subjects:

A. Anaphoric form (at 0):

Subjects totals': Same as the second row for each of the subjects in 3.3.1: D.1.

Means: Same as the second row in 3.3.1: D.2

B. Distance (at 0):

Subjects' totals: Same as the second column for each of the subjects in 3.3.1: E.1.

Means: Same as the second column in 3.3.1: E.2

C. Distance X Anaphoric form (at 0):

C.1 Subjects' totals:

See Table 3.2.1 for the totals of each subject on:

1. 0 + 1/P, 0 + 1/N
2. 0 + 3/P, 0 + 3/N

C.2 Means:

See Table 3.2.1 for the means of:

1. 0 + 1/P, 0 + 1/N
2. 0 + 3/P, 0 + 3/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	1398217.527	27	51785.83	
Anaphoric form	32674.723	1	32674.723	26.73*
Error (S X Ana)	32999.527	27	1222.2	
Distance	1337.223	1	1337.223	.51
Error (S X Dis)	70717.027	27	2619.15	
Dis X Ana	4719.01	1	4719.01	3.28**
Error (S X Dis X Ana)	38824.24	27	1437.93	

* $P < .001$

** $P < .10$

1. Simple effects of Anaphoric form:

1.1. At O +1: $F(1,54) = 4.72$, $P < .05$

1.2 At O +3: $F(1,54) = 23.39$ $P < .0001$

2. Simple effects of Distance:

2.1 At O/P: $F < 1$

2.2 At O/N: $F(1,50) = 2.73$, $P < .05$

3.5.2. By Sentences:

A. Anaphoric form (at O):

Sentences' totals: Same as the second row for each of the sentences in 3.3.2: D.1.

Means: Same as the second row in 3.3.2. D.2

B. Distance (at O):

Sentences' totals: Same as the second column for each of the sentences in 3.3.2: E.1

Means: Same as the second column in 3.3.2: E.2

C. Distance X Anaphoric form (at 0):

C.1 Sentences' totals:

See Table 3.2.2 for the totals of each on:

1. 0 + 1/P, 0 + 1/N

2. 0 + 3/P, 0 + 3/N

C.2 Means:

See Table 3.2.2. for the means of:

1. 0 + 1/P, 0 + 1/N

2. 0 + 3/P, 0 + 3/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	231217.23	11	21019.75	
Anaphoric form	76241.02	1	76241.02	2.15
Error (Sen X Ana)	390081.23	11	35461.93	
Distance	3120.19	1	3120.19	.26
Error (Sen X Dis)	131071.06	11	11915.55	
Dis X Ana	11011.02	1	11011.02	.21
Error (Sen X Dis X Ana)	589627.23	11	53602.48	

1. Simple effects of Anaphoric form:

1.1. At 0 + 1: $F < 1$

1.2. At 0 + 3: $F(1,21) = 1.63$, $P > .05$

2. Simple effects of Distance:

2.1 At 0/P: $F < 1$

2.2. At 0/N: $F < 1$

3.6. SUB PLAN 3: DATA AND ANALYSIS OF VARIANCE:

3.6.1 By Subjects:

A. Antecedent (at P):

Subjects' totals: Same as the first column for each of the subjects in 3.3.1: D.1

Means: Same as the first column in 3.3.1: D.2.

B. Distance (at P):

Subjects' totals: Same as the first column for each of the subjects in 3.3.1: F.1.

Means: Same as the first column in 3.3.1: F.2

C. Distance X Antecedent (at P):

C.1. Subjects' totals:

See Table 3.2.1. for the totals of each subject on:

1. S + 1/P, O + 1/P
2. S + 3/P, O + 3/P

C.2. Means:

See Table 3.2.1. for the means of:

1. S + 1/P, O + 1/P
2. S + 3/P, O + 3/P

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	1474252.359	27	54601.94	
Antecedent	28800.143	1	28800.143	32.14*
Error (S X Ant)	24196.357	27	896.16	
Distance	371.571	1	371.571	.18
Error (S X Dis)	56133.929	27	2079.03	
Dis X Ant	165.143	1	165.143	.12
Error (S X Dis X Ant)	37670.357	27	1395.2	

* P < .001

Simple effects of Antecedent:

A. At P + 1: F (1,52) = 10.74, P < .005

B. At P + 3: F (1,52) = 14.54, P < .001

3.6.2. By Sentences:

A. Antecedent (at P):

Sentences' totals: Same as the first column for each of the sentences in 3.3.2: D.1

Means: Same as the first column in 3.3.2: D.2

B. Distance (at P):

Sentences' totals: Same as the first column for each of the sentences in 3.3.2: F.1.

Means: Same as the first column in 3.3.2: F.2

C. Distance X Antecedent (at P):

C.1. Sentences' totals:

See Table 3.2.2. for the totals of each sentence on:

1. S + 1/P, O + 3/P

2. S + 3/P, O + 3/P

C.2. Means:

See Table 3.2.2. for the means of:

1. S + 1/P, O + 1/P

2. S + 3/P, O + 3/P

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	526257.17	11	47841.56	
Antecedent	67200.34	1	67200.34	13.13*
Error (Sen X Ant)	56290.16	11	5117.29	
Distance	867	1	867	.01
Error (Sen X Dis)	702599.5	11	63872.68	
Dis X Ant	385.33	1	385.33	.11
Error (Sen X Dis X Ant)	36996.17	11	3363.2	

* $P < .005$

Simple effects of Antecedent:

A. At P + 1: $F(1,21) = 6.77$, $P < .025$

B. At P + 3: $F(1,21) = 9.17$, $P < .01$

3.7. SUB PLAN 4: DATA AND ANALYSIS OF VARIANCE:

3.7.1. By Subjects:

A. Antecedent (at N):

Subjects' totals: Same as the second column for each of the subjects in 3.3.1: D.1

Means: Same as the second column in 3.3.1: D.2.

B. Distance (at N):

Subjects' totals: Same as the second column for each of the subjects in 3.3.1: F1

Means: Same as the second column in 3.3.1: F.2

C. Distance X Antecedent (at N):

C.1. Subjects' totals:

See Table 3.2.1. for the totals of each subject on:

1. S + 1/N, O + 1/N
2. S + 3/N O + 3/N

C. 2 Means:

See Table 3.2.1 for the means of:

1. S + 1/N, O + 1/N
2. S + 3/N, O + 3/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	1310270.741	27	48528.55	
Antecedent	2.58	1	2.58	.003
Error (S X Ant)	25870.17	27	958.15	
Distance	3645.723	1	3645.723	1.17
Error (S X Dis)	84479.027	27	3128.85	
Dis X Ant	2014.509	1	2014.509	.95
Error (S X Dis X Ant)	56965.241	27	2109.82	

Simple effects of Antecedent:

A. At N + 1: $F < 1$

B. At N + 3: $F < 1$

3.7.2. By Sentences :

A. Antecedent (at N):

Sentences' totals: Same as the second column for each of the sentences in 3.3.2: D.1

Means: Same as the second column in 3.3.2: D.1

B. Distance (at N):

Sentences' totals: Same as the second column for each of the sentences in 3.3.2: F.1

Means: Same as the second column in 3.3.2: F.2

C. Distance X Antecedent (at N):

C.1 Sentences' totals:

See Table 3.2.2. for the totals of each sentence on:

1. S + 1/N, O + 1/N
2. S + 3/N, O + 3/N

C.2. Means:

See Table 3.2.2. for the means of:

1. S + 1/N, O + 1/N
2. S + 3/N, O + 3/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	498432.73	11	45312.07	
Antecedent	6.02	1	6.02	.001
Error (Sen X Ant)	95356.73	11	8668.79	
Distance	8506.69	1	8506.69	.15
Error (Sen X Dis)	623954.06	11	56723.10	
Dís X Ant.	4700.52	1	4700.52	2.75
Error (Sen X Dis X Ant)	18827.23	11	1711.57	

Simple effects of antecedent:

A. At N + 1: $F < 1$

B. At N + 3: $F < 1$

3.8. SUB PLAN 5: DATA AND ANALYSIS OF VARIANCE:

3.8.1. By Subjects:

A. Antecedent (at +1):

Subjects' totals: Same as the first row for each of the subjects in 3.3.1: E.1 above

Means: Same as the first row in 3.3.1: E.2 above

B. Anaphoric form (at +1):

Subjects' totals: Same as the first row for each of the subjects in 3.3.1: F.1 above

Means: Same as the first row in 3.3.1: F.2 above

C. Antecedent X Anaphoric form (at +1):

C.1. Subjects' totals:

See Table 3.2.1 for the totals of each subject on:

1. S + 1/P, S + 1/N
2. O + 1/P, O + 1/N

C. Means:

See Table 3.2.1 for the means of:

1. S + 1/P, S + 1/N
2. O + 1/P, O + 1/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	1553521.27	27	57537.83	
Antecedent	10013.223	1	10013.223	9.19*
Error (S X Ant)	29431.027	27	1090.04	
Anaphoric form	3055.581	1	3055.581	1.53
Error (S X Ana)	53859.669	27	1994.80	
Ant X Ana	3225.009	1	3225.009	2.11
Error (S X Ant X Ana)	41347.241	27	1531.38	

* P < .01

3.8.2. By Sentences:

A. Antecedent:

Subjects' totals: Same as the first row for each of the sentences in 3.3.2: E.1

Means: Same as the first row in 3.3.2: E.2

B. Anaphoric form (at +1):

Sentences' totals: Same as the first row for each of the sentences in 3.3.2: F.1

Means: Same as the first row in 3.3.2: F.2

C. Antecedent X Anaphoric form (at +1):

C.1. Sentences' totals:

See Table 3.2.2. for the totals of each sentence on:

1. S + 1/P, S + 1/N
2. O + 1/P, O + 1/N

C.2 Means:

See Table 3.2.2. for the means of:

1. S + 1/P, S + 1/N
2. O + 1/P, O + 1/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Sentences	209618.23	11	19056.2	
Antecedent	23364.19	1	23364.19	4.45*
Error (Sen X Ant)	57772.06	11	5252.01	.09
Anaphoric form	7129.69	1	7129.69	
Error (Sen X Ana)	858697.56	11	78063.41	
Ant X Ana	7525.02	1	7525.02	1.37
Error (Sen X Ant X Ana)	60284.23	11	5480.38	

* Critical value for P = .05 is 4.84

3.9 SUB PLAN 6: DATA AND ANALYSIS OF VARIANCE:

3.9.1 By Subjects:

A. Antecedent (at +3):

Subjects' totals: Same as the second row for each of the subjects in 3.3.1: E.1 above

Means: Same as the second row in 3.3.1: E.2 above

B. Anaphoric form (at +3):

Subjects' totals: Same as the second row for each subject in 3.3.1: F.1 above

Means: Same as the second row in 3.3.1: F.2 above

C. Antecedent X Anaphoric form (at +3):

C.1 Subjects' totals:

See Table 3.2.1 for the totals of each subject on:

1. S + 3/P, S + 3/N
2. O + 3/P, O + 3/N

C.2 Means:

See Table 3.2.1 for the means of:

1. S + 3/P, S + 3/N
2. O + 3/P, O + 3/N

D. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	1260970.357	27	46702.61	
Antecedent	4628.571	1	4628.571	2.36
Error (S X Ant)	52916.929	27	1959.89	
Anaphoric form	18207	1	18207	8.66*
Error (S X Ana)	56784.5	27	2103.13	
Ant X Ana	13115.572	1	13115.572	16.86**
Error (S X Ant X Ana)	21006.928	27	778.03	

* P < .01

* P < .001

3.9.2. By Sentences:

A. Antecedent (at +3):

Sentences' totals: Same as the second row for each of the sentences in 3.3.2: E.1

Means: Same as the second row in 3.3.2: E.2

B. Anaphoric form (at +3):

Sentences' totals: Same as the second row for each of the sentences in 3.3.2: F.1

Means: Same as the second row in 3.3.2: F.2

C. Antecedent X Anaphoric form (at +3):

C.1 Sentences' totals:

See Table 3.2.2 for the totals of each sentence on:

1. S + 3/P, S + 3/N

2. O + 3/P, O + 3/N

C.2 Means:

See Table 3.2.2 for the means of:

1. S + 3/P, S + 3/N
2. O + 3/P, O + 3/N

D. ANOVA Summary:

Source of Variation	Ss	df	Ms	F
Sentences	261316.67	11	23756.06	
Antecedent	10800	1	10800	1.57
Error (Sen X Ant)	75640	11	6876.36	
Anaphoric form	42483	1	42483	.46
Error (Sen X Ana)	1021611	11	92873.73	
Ant X Ana	30603	1	30603	24.44*
Error (Sen X Ant X Ana)	13774	11	1252.18	

* $P < .001$

3.10 FOREGROUNDED V BACKGROUNDED: DATA AND ANALYSIS OF VARIANCE BY SUBJECTS:

A. Subjects' totals: number of sentences is 12

Ss	F	B
1	1073	1786
2	989	1448
3	565	921
4	762	840
5	752	1170
6	1034	1518
7	1026	862
8	807	1249
9	852	1127
10	866	1082
11	1548	2016
12	836	998
13	997	1425
14	1654	1964

Ss	F	B
15	946	1218
16	921	870
17	603	498
18	984	965
19	596	633
20	782	1106
21	1230	1343
22	742	776
23	293	718
24	724	860
25	528	692
26	562	1296
27	929	1023
28	401	640

B. Means: number of sentences is 12

F	B
857.2	1108.7

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	5834480.93	27		
Within subjects	1584457	28		
Treatments	885531.5	1	885531.5	34.21*
Error	698925.5	27	25886.13	

* $P < .001$

3.11 FOREGROUNDED V BACKGROUNDED 1 V BACKGROUNDED 3:

DATA AND ANALYSIS OF VARIANCE BY SUBJECTS:

A. Subjects' mean scores: *Total of each subject was divided by number of trials*

Ss	F	B1	B3
1	89.4	162	139.4
2	82.4	148.2	101
3	47.1	77.8	76
4	63.5	71.6	68.9
5	62.7	75.2	113.4
6	86.2	125.8	127
7	85.5	84.2	63
8	67.3	99.6	110.4
9	71	69.1	128.6
10	72.2	78.9	106
11	129	169.9	165.4
12	69.7	73.3	97
13	83.1	115	124
14	137.8	152.9	178.8

Ss	F	B1	B3
15	78.8	65.6	127.1
16	76.8	98	54.3
17	50.3	49.6	35.7
18	82	89.2	74.1
19	49.7	58.2	48.9
20	65.2	115.6	75.4
21	102.5	129.6	99.3
22	61.8	51.9	82.6
23	24.4	45.4	80
24	60.3	51.9	99.4
25	44	53.9	63
26	46.8	106.1	110.6
27	77.4	81.3	90.8
28	33.4	32.3	82.8

B. Means: per subject per trial

F	B1	B3
71.4	90.4	97.2

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	66544.5803	27		
Within subjects	28802.0067	56		
Treatments	10016.2695	2	5008.13	14.4*
Error	18785.7372	54	347.88	

* $P < .001$

D. Difference between treatments' totals: the q statistic

1. F v B1:

The critical value for the difference TB1 - TF = 531.8 is 371.09. Hence F is significantly faster then B1, $P < .01$

2. F v B3:

The critical value for the difference TB3, - TF = 722.6 is 422.39. Hence F is significantly faster than B3, $P < .01$

3. B1 v B3:

The critical value for the difference TB3, - TB1 = 190.8 is 371.09. Hence the hypothesis TB3 = TB1 is accepted.

3.12 CURRENT SUBJECT V CURRENT OBJECT (ANAPHORIC FORM PRONOUN): DATA AND ANALYSIS OF VARIANCE BY SUBJECTS:

A. Subjects' totals: number of sentences is 6

P

Ss	CS	CO
1	561	462
2	692	827
3	553	313
4	358	335
5	459	308
6	328	390
7	450	388
8	301	340
9	375	324
10	348	448
11	875	1019
12	1108	1100
13	939	763
14	941	973

P

Ss	CS	CO
15	506	595
16	427	355
17	521	543
18	790	727
19	344	252
20	550	573
21	766	741
22	401	362
23	228	235
24	274	261
25	271	373
26	226	371
27	618	487
28	258	316

B. Means: number of sentences is 6

P

CS	CO
516.7	506.5

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	3090910.05	27		
Within subjects	132217.5	28		
Treatments	1470.87	1	1470.87	.3
Error	130746.63	27	4842.47	

3.13 SUBJECT V OBJECT (ANAPHORIC FORM PRONOUN/REFERENT KEPT IN THE FOREGROUND): DATA AND ANALYSIS OF VARIANCE BY SUBJECTS.

A. Basic Observations: number of sentences is 6

Ss	CoS	C1S	C2S	CoO	C1O	C2O
1	437	574	519	448	552	401
2	734	835	764	919	772	839
3	308	381	352	285	389	374
4	282	427	408	353	445	419
5	381	395	425	404	407	372
6	239	374	342	326	292	348
7	362	407	427	318	540	351
8	422	607	564	550	625	561
9	349	364	341	400	423	373
10	420	485	448	523	550	496
11	768	861	793	670	623	799
12	362	276	182	354	288	431
13	466	408	495	528	452	426
14	791	757	745	834	746	710
15	515	459	413	404	374	419
16	422	462	461	282	435	365
17	406	379	389	426	313	436
18	982	956	1044	942	816	835
19	1135	1086	1218	1111	1074	1054
20	804	763	582	652	612	796
21	940	949	1008	867	810	805
22	450	374	342	354	307	350
23	269	369	367	287	204	262
24	293	324	363	284	233	268
25	301	358	380	278	229	202
26	361	423	279	397	352	360
27	520	481	481	685	595	516
28	379	325	327	218	322	200

B. Antecedent:

B.1 Subjects' totals: number of sentences is 18

Ss	S	O
1	1530	1401
2	2333	2530
3	1041	1048
4	1117	1217
5	1201	1183
6	955	966
7	1196	1209
8	1593	1736
9	1054	1196
10	1353	1569
11	2422	2092
12	820	1073
13	1369	1406
14	2293	2290

Ss	S	O
15	1387	1197
16	1345	1082
17	1174	1175
18	2982	2593
19	3439	3239
20	2149	2060
21	2897	2482
22	1166	1011
23	1005	753
24	980	785
25	1039	709
26	1063	1109
27	1482	1796
28	1031	740

B.2 Means: number of sentences is 18

S	O
1550.6	1487.4

C. Type of Current:

C.1 Subjects' totals: number of sentences is 12

Ss	Co	C1	C2
1	885	1126	920
2	1653	1607	1603
3	593	770	726
4	635	872	827
5	785	802	797
6	565	666	690
7	680	947	778
8	972	1232	1125
9	749	787	714
10	943	1035	944
11	1438	1484	1592
12	716	564	613
13	994	860	921
14	1625	1503	1455

Ss	Co	C1	C2
15	919	833	832
16	704	897	826
17	832	692	825
18	1924	1772	1879
19	2246	2160	2272
20	1456	1375	1378
21	1807	1759	1813
22	804	681	692
23	556	573	629
24	577	557	631
25	579	587	582
26	758	775	639
27	1205	1076	997
28	597	647	527

C.2 Means: number of sentences is 12

Co	C1	C2
1007.1	1022.8	1008.1

D. Antecednet X Type of Current:

D.1 Subjects' totals: see 3.13: A

D.2 Means: number of treatments is 6

	Co	C1	C2
S	503.5	530.7	516.4
O	503.6	492.1	491.7

E. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Subjects	8191350.83	27	303383.36	
Antecedent	18627.15	1	18627.15	2.71
Error (S X Ant)	185415.02	27	6867.22	
Type of Current	2178.63	1	1089.32	.35
Error (S X T.C)	166741.04	54	3087.8	
Ant X T.C	10689.33	2	5344.67	1.51
Error (S X Ant X T.C)	191493	54	3546.17	

3.14 SUBISDIARY ANALYSES:

3.14.1 POSITIVE V NEGATIVE: DATA AND ANALYSIS OF VARIANCE BY SUBJECTS:

A. Subjects' mean scores: Total of each subject divided by number of trials

Ss	POS	NEG
1	75.3	99.4
2	127.9	148
3	65.7	72.2
4	61.5	69
5	63.5	74.4
6	53.5	47.4
7	71.8	63.8
8	67.6	64.6
9	69.1	68.2
10	65.1	154.3
11	149.5	154.3
12	177.2	188.4
13	126.2	112.8
14	151.8	154.3

Ss	POS	NEG
15	85.7	105.8
16	62	63
17	80.4	87.4
18	120.4	133
19	53.6	41
20	79.7	87.6
21	125.1	128
22	61	56.6
23	49.3	59
24	50.1	49.9
25	46.2	56.4
26	61.6	67.4
27	93.4	82.6
28	49.9	57.4

B. Means: per subject per trial

POS	NEG
83.7	87.8

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	73912.7562	27		
Within subjects	1467.355	28		
Treatments	234.1116	1	234.11	5.13*
Error	1233.2435	27	45.68	

* $P < .05$

3.14.2 AGEN/DRI V ATTRIB/R1: DATA AND ANALYSIS OF VARIANCE BY SUBJECTS:

A: Subjects' mean scores: Total of each subject was divided by number of trials

Ss	Agen/DR1	Attrib/R1
1	67.3	81
2	113.9	140.2
3	80.1	66.3
4	62.6	67.9
5	62.3	67.5
6	40.8	59.2
7	75.3	74.6
8	71.9	66.1
9	71.3	73.5
10	63.9	71.2
11	140.4	156.1
12	161.9	185.2
13	120.7	135.5
14	153.4	145.6

Ss	Agen/DR1	Attrib/R1
15	73.5	102.3
16	50.1	63.8
17	76.1	82.5
18	112.5	127.3
19	50.1	50.6
20	82.5	79
21	120.4	132.7
22	57.4	60.2
23	53.9	50.2
24	51	49.5
25	40	40.8
26	69.2	53.2
27	87.6	97.4
28	49.3	52.5

B. Means: per subject per trial

Agen/Dr1	Atrrib/R1
80.7	86.9

C. ANOVA Summary:

Source of variation	Ss	df	Ms	F
Between subjects	68854.1048	27		
Within subjects	2226.325	28		
Treatments	531.3616	1	531.36	8.46*
Error	1694.9434	27	62.78	

* $P < .01$

3.14.3 CORRELATION BETWEEN LENGTH OF SENTENCES (IN WORDS AND TIME) AND REACTION TIME: DATA AND RESULTS

A: Data: number of subjects is 14

Sen	LW	LT	RT
1	5	110	1563
2	4	89	1317
3	4	170	1291
4	5	112	1548
5	3	102	1105
6	4	124	1052
7	10	204	1323
8	7	177	1180
9	4	114	1450
10	8	215	1146
11	4	97	1346
12	5	116	1174
13	6	143	1167
14	7	209	927

Sen	LW	LT	RT
15	8	186	1086
16	4	87	1434
17	5	140	1160
18	5	158	892
19	3	80	1467
20	5	153	1193
21	4	121	884
22	10	221	1223
23	4	79	1238
24	5	116	1003
25	5	219	826
26	4	165	1008
27	4	103	1105
28	5	135	1074

Sen	LW	LT	RT
29	3	114	1233
30	4	113	1057
31	8	184	953
32	7	145	1368
33	5	217	816
34	9	175	1187
35	4	108	1094
36	5	132	958
37	5	163	1060
38	6	157	1078
39	3	90	1290
40	6	152	1070
41	3	154	889
42	7	178	1240

Sen	LW	LT	RT
43	4	101	1172
44	7	177	793
45	3	138	1100
46	9	172	1110
47	6	153	879
48	6	152	873
49	5	149	1526
50	3	85	1478
51	5	134	1385
52	6	157	1210
53	3	134	1211
54	5	118	1444
55	9	205	1211
56	8	156	1488

Sen	LW	LT	RT
57	4	123	1389
58	6	136	1698
59	5	136	1257
60	3	80	1434
61	5	153	1010
62	5	133	1163
63	6	146	1092
64	6	180	1160
65	5	183	1198
66	4	78	1311
67	6	144	1408
68	6	173	1264
69	4	143	1189
70	4	77	1235
71	4	115	1279
72	6	148	1164
73	5	177	1188

Sen	LW	LT	RT
74	5	78	1125
75	5	117	1152
76	6	137	1218
77	5	165	1024
78	7	161	1134
79	7	191	1209
80	9	215	1373
81	6	170	1131
82	4	142	1308
83	4	130	1196
84	4	152	1133
85	4	119	886
86	6	129	812
87	4	124	976
88	5	179	980
89	4	124	1259
90	7	179	1052

Sen	LW	LT	RT
91	6	146	963
92	6	176	1055
93	3	156	1086
94	7	188	1274
95	7	148	1403
96	5	176	1201

B. Results:

B.1 Length in words and reaction time:

r = - .013 (with 94 df / not significant).

B.2 Length in time and reaction time:

r = - .103 (with 94 df / not significant)